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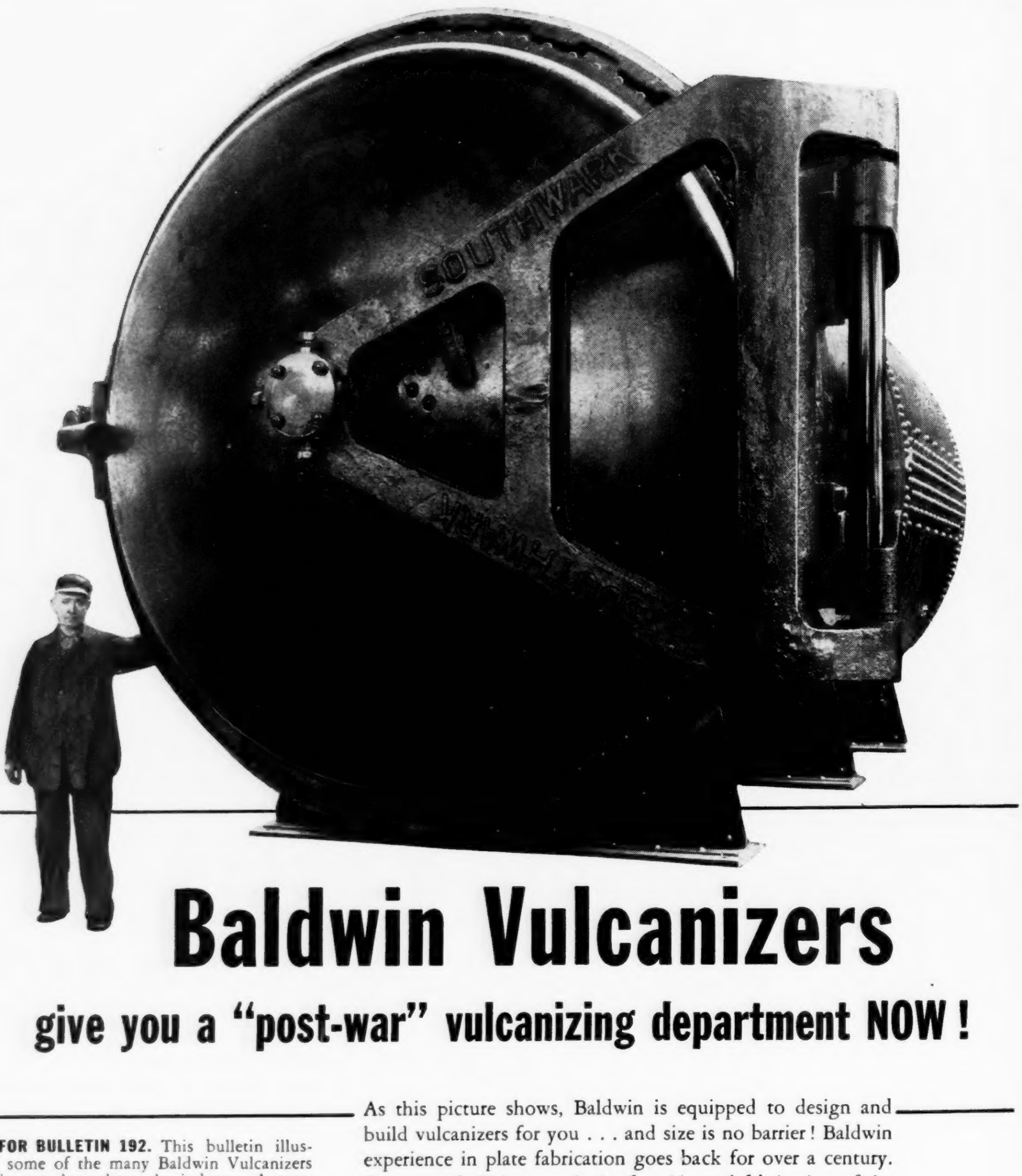
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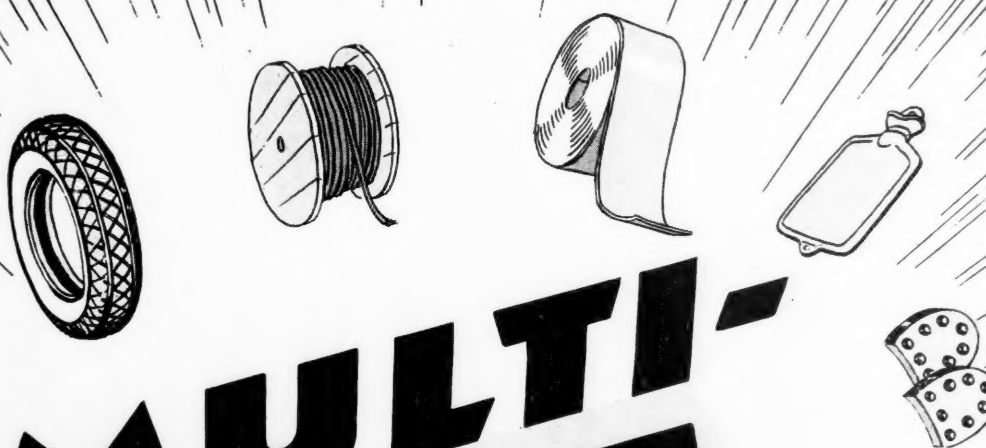


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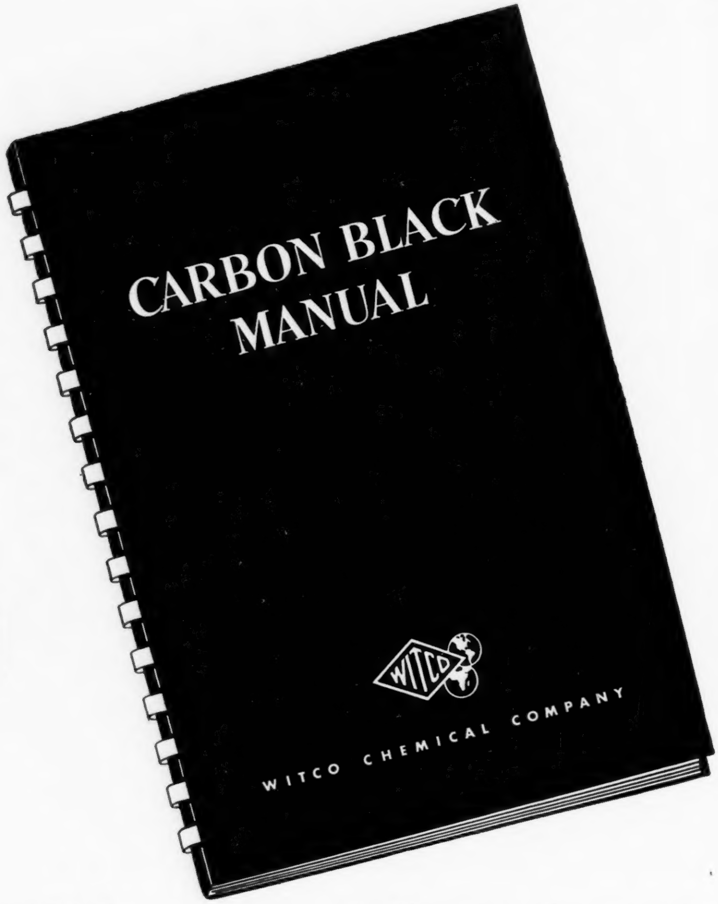

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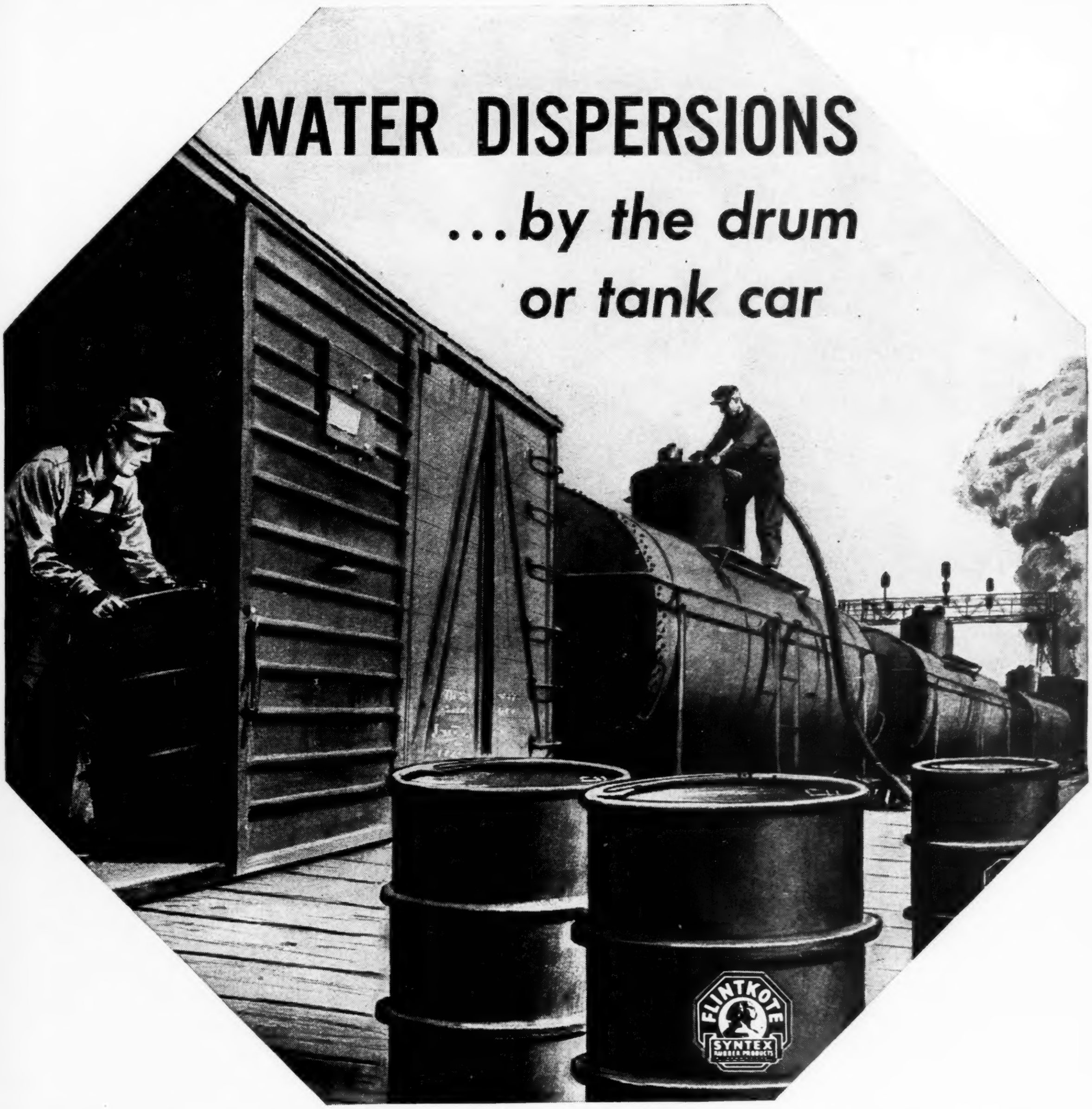

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30	1810	650	225	340	490	795	.18
45	1485	605	230	305	495	800	.11
60	1385	590	230	345	540	770	.07
90	1880	680	225	300	450	680	.12

Time of Cure Min. at 45 Lb.	Shore Hardness	Goodyear-Healey Pendulum: Indentation in mm.	Goodyear-Healey Pendulum: Per Cent Rebound	Compression Fatigue (Goodrich Flexometer)*: Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C.	Dynamic Compression: Initial	Dynamic Compression: Final	Cut-Growth Resistance Inches—Failure at 15,000 Cyc.	48,000 Cyc.
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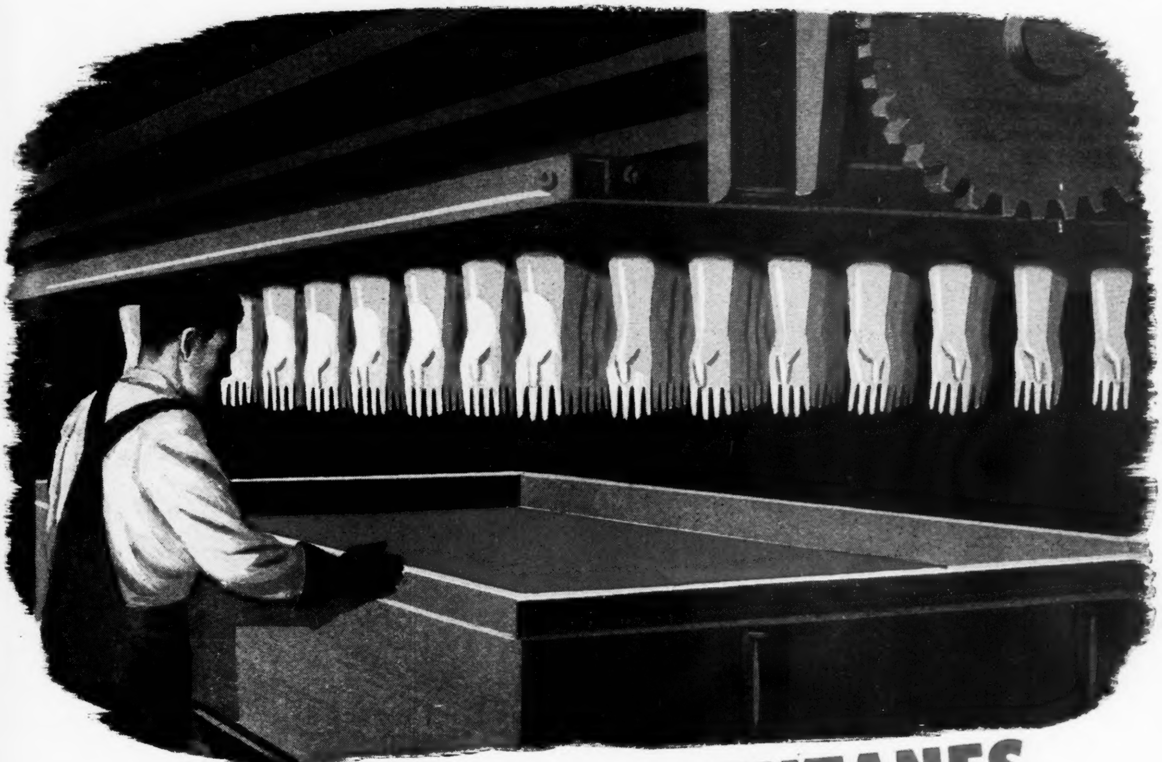

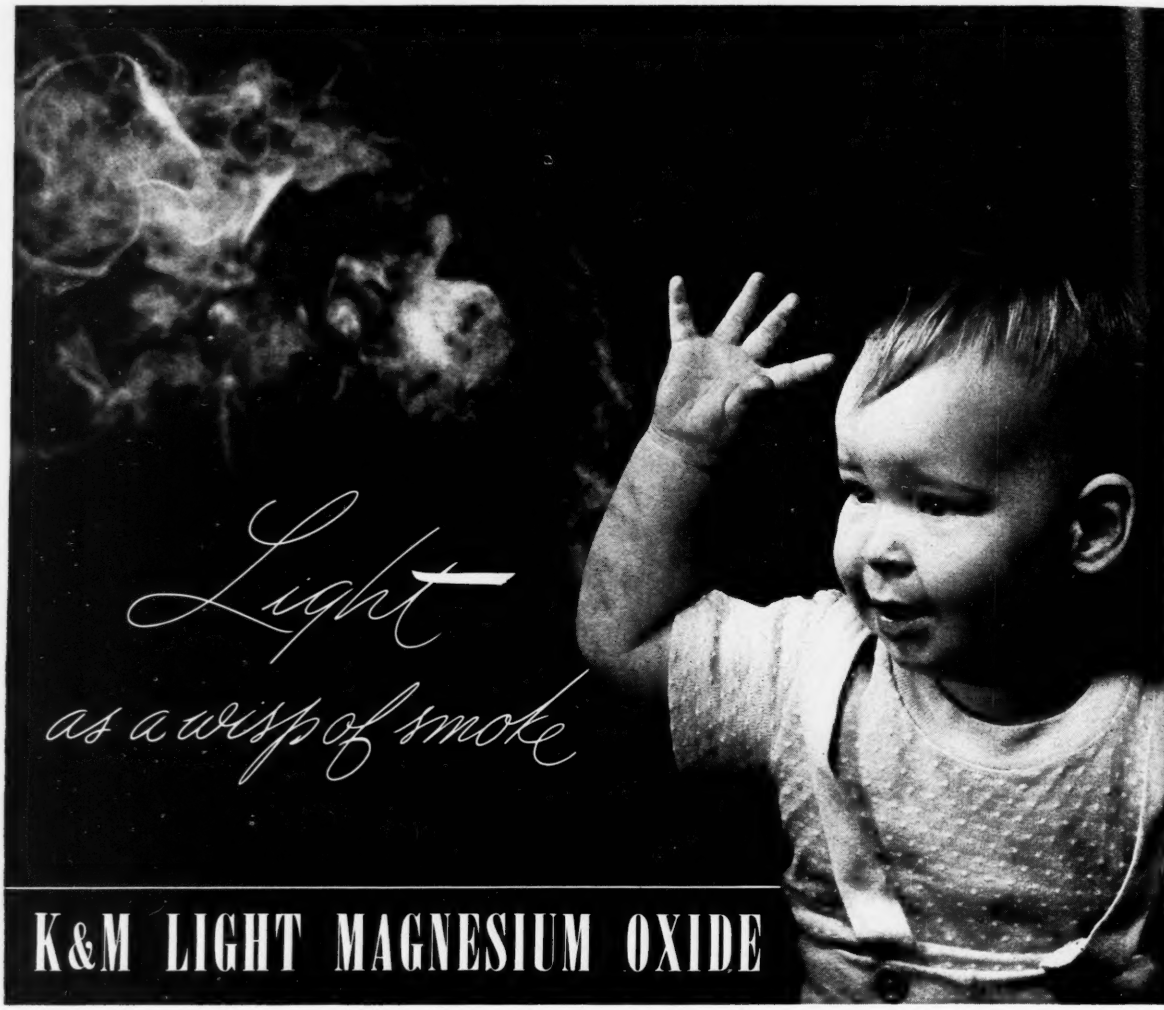
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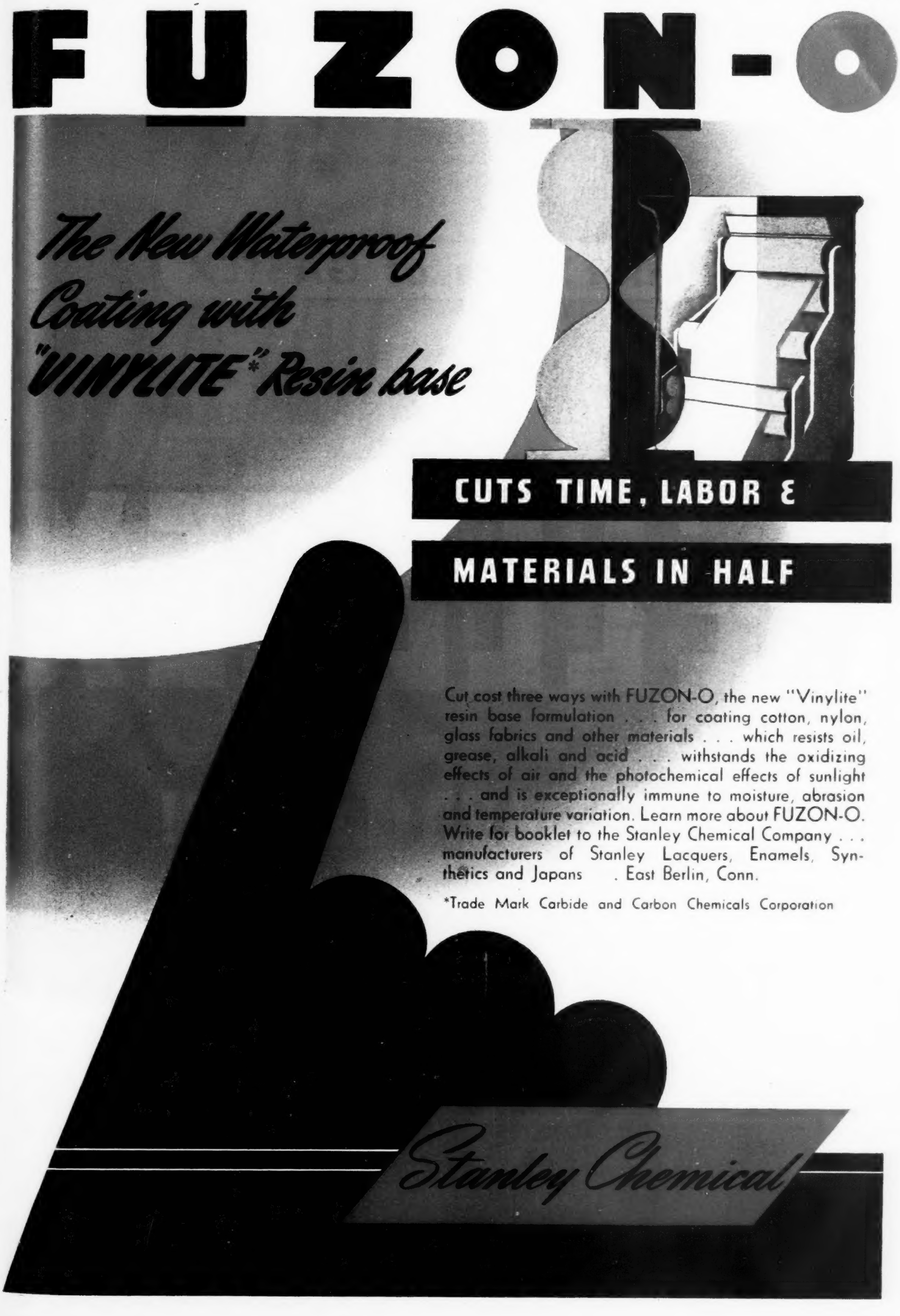
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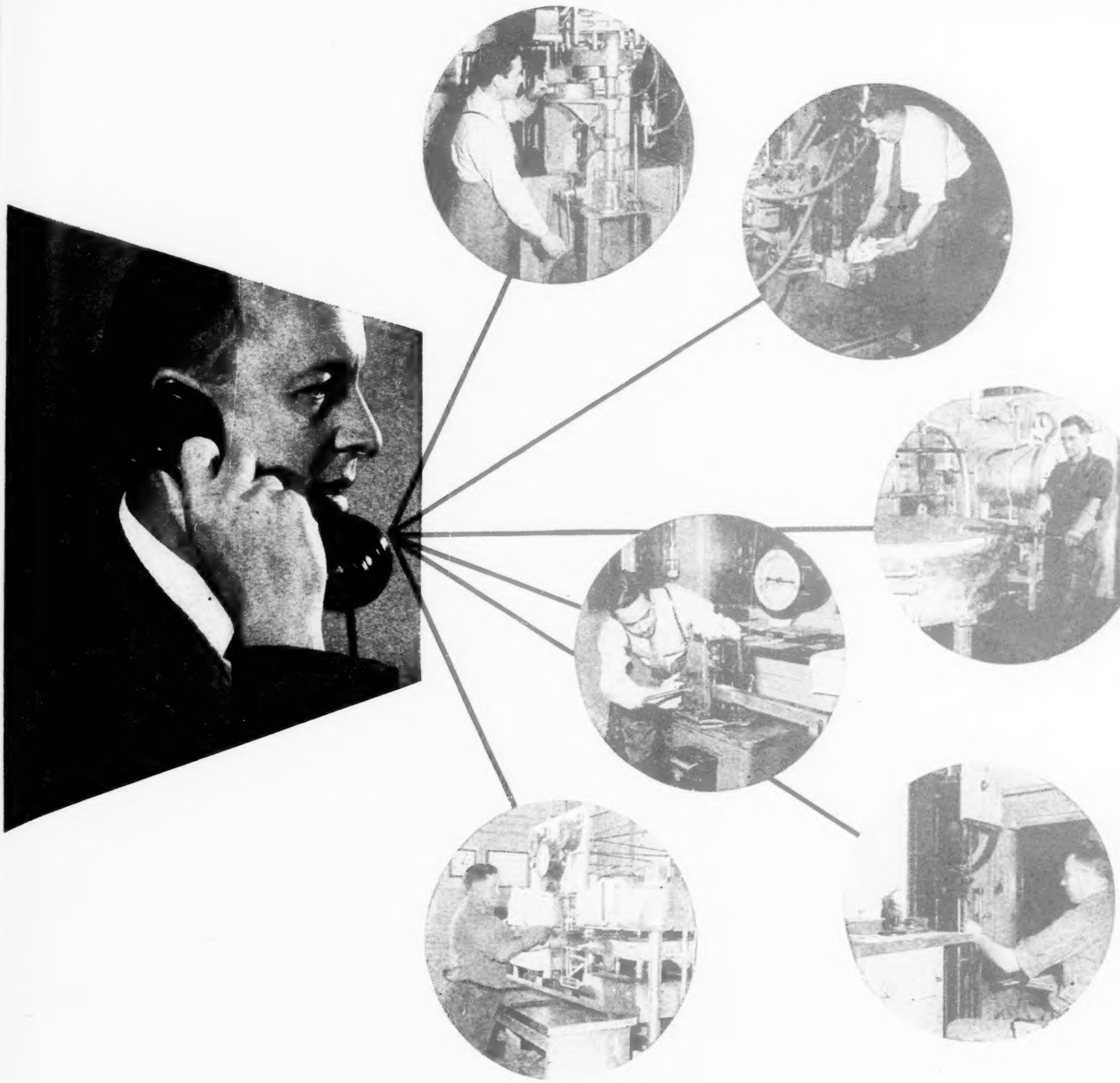

August, 1945

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INDIA

RUBBER WORLD

NATURAL & SYNTHETIC

CONTENTS

DEPARTMENTS

MARKET REVIEWS

STATISTICS

ARTICLES

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NATURAL & SYNTHETIC

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Non-Sulphur Vulcanization—A Survey—I[1]

Turner Alfrey,[2] J. G. Hendricks,[2] Robert M. Hershey,[2] and H. Mark[2]

THE vulcanization of rubber is essentially the formation of intermolecular linkages between the long linear chains. The result of reaction is reflected in both chemical and physical changes. Thus crude rubber is converted by vulcanization from a plasto-elastic material into a stable elastic product of increased strength and resistance to solvents.

The cross-linking reaction is carried out traditionally by application of heat to an intimate mixture of rubber and sulphur. This reaction may be modified both chemically and physically by the addition of metallic oxides and complex organic reagents, e.g., thiazoles or thiurams which accelerate the process. Vulcanization can also be accomplished by the use of peroxides, diazoaminobenzenes, polynitrobenzenes, quinones, etc.

The precise mechanism by which vulcanization takes place has withstood more than a century of intensive investigation. We have not yet equipped ourselves adequately either in thought or technique in our investigation of the solid state to trace completely the nature and origin of the relatively few cross-links in the highly reactive and complicated macromolecules. Nevertheless many outstanding contributions have been made.

It has long been assumed that vulcanization is primarily an addition reaction taking place directly at the double bonds of the polyisoprene chain. Recently this long accepted idea has been challenged by the researches of Farmer (*20, 21, 22, 23*)[3] and others (*2, 73*). Two fundamental conceptions are embodied in their work and their approach to this problem:

1. The alpha methylenic hydrogen atom is characterized by its liability because of its proximity to the double bond and is therefore a logical point of attack.

2. The characteristics, reagents, and conditions of vulcanization reactions are strongly indicative of free radical mechanisms.

One extremely interesting approach to the mechanism of sulphur vulcanization utilized by Blake (10), Fisher (26), and Farmer (20) is through an examination of organic vulcanizing agents. An understanding of the nature of these reactions, while not necessarily directed analogous to sulphur vulcanization, would undoubtedly broaden our fundamental conception of the process as a whole. Furthermore certain practical aspects of the new synthetic rubbers offer problems that may well be solved through the use of suitable non-sulphur vulcanizing agents.

The importance of free radicals and free radical reactions in non-sulphur vulcanization is indicated in the following classification of organic vulcanizing agents:

TYPE I: Compounds which decompose thermally at vulcanizing temperatures (20-170° C.) to yield free radicals. These include benzoyl peroxide, the diazoaminobenzenes, dichloroazodicarbonamidine.

TYPE II: Suitable oxidants of appropriate resonance structure. Quinones, quinone oximes and imines and polynitrobenzenes are examples.

TYPE III: Agents which yield free radicals on oxidation. Aromatic amines and mercaptans, phenols and dihydric phenols bring about vulcanization when used with a proper oxidizing agent.

TYPE IV: Miscellaneous agents. Grignard reagents, zinc alkyls and Durite Resin are examples, but, at present at least, they do not vulcanize unmodified natural rubber.

Theories of Non-Sulphur Vulcanization

Oxygen Vulcanization

Ostromislensky (64) Stevens (79) and Twiss (82) consider that vulcanization with benzoyl peroxide and nitro compounds in the chemical stages represents an oxidation of rubber. The basis of this theory is that oxygen is a close analog of sulphur. This conception is made clear by the following statement:

"Vulcanization by nitro compounds may result from the fact that a negligible quantity of oxygen is split off the molecule . . . the oxygen-like activated sulphur is apparently added to the double bonds of the rubber *in statu nascendi.*"

Wright and Davies (87) support this theory to some extent in stating that the oxygen from one mole of dinitrobenzene saturates 1.5 double bonds of the rubber.

Polymerization Theory[4]

Whitby (85) considers that non-sulphur vulcanization of rubber involves polymerization as an essential feature. He draws the obvious parallel between the action of benzoyl peroxide as a polymerization catalyst for vinyl acetate and as a vulcanizing agent for rubber. Van Rossem (71) believes polymerization should play a joint role with dehydrogenation in peroxide vulcanization, and Shimada (75) visualizes the reduction of viscosity of natural rubber sols by peroxide to support this theory. Levi (49) favors the polymerization theory for diazoamino benzene vulcanization since this agent also is an energetic catalyst of polymerization.

Quinoid Theory

The most popular theory of non-sulphur vulcanization was proposed by Fisher (26) in 1939. He discovered and perfected

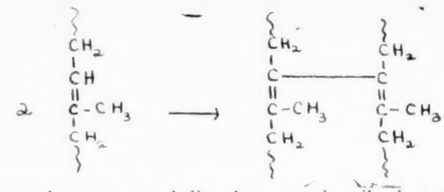
[1] This is the first part of one of two papers on this subject. The second installment will be published next month. Part II, to be presented soon, will report the experimental work.
[2] Polytechnic Institute of Brooklyn, Brooklyn, N. Y.
[3] Bibliography references appear at end of article.
[4] In a personal communication to the authors, Whitby states that he now believes the mechanism to be a chain reaction of a type similar to that proposed by the authors in the section following.

many vulcanizing agents, particularly derivatives of quinone, but his theory has been applied to most, if not all, non-sulphur agents. The conception is based on the observation that most vulcanizing agents are bifunctional and that during vulcanization about half of the original reagent is recovered in a reduced state.

"To summarize, the quinoid structure as an active grouping is found in many of the vulcanizing agents, and may, therefore, play a part in the chemistry of vulcanization . . . a further study of all the reactions indicates that the hydroxyl, amino and imino groups may play an even more important part. The active grouping catalyzed perhaps by the oxidizing agent present seems to add to the rubber, and then this addition product seems to be oxidized to form the vulcanizate."

All of the original reagents which Fisher worked with "have two reactive groups in them, and this fact fitted in nicely with the bridge theory." He then found that simple aromatic amines and phenols also work in the presence of an oxidizing agent. These are explained in the quinoid theory as capable of forming quinones by oxidation or by tautomeric rearrangement.

Ostromislensky (64) has added his own modifications to Fisher's theory: "It can hardly be doubted but that two molecules of tetrachloraquinone react in vulcanization with three molecules of polyprene."



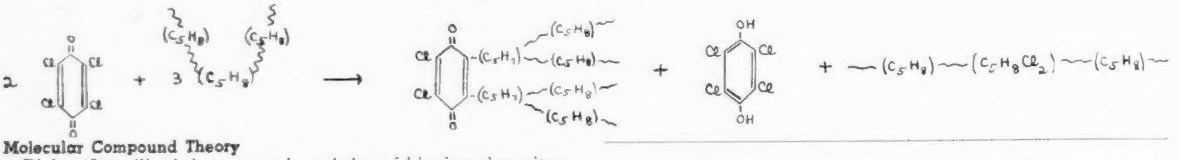
Quinone, however, was believed to act primarily through a different mechanism (51).

Free Radical Vulcanization

Farmer (23) has pointed out that certain types of vulcanizing agents, viz., peroxides and diazoamino compounds are capable of undergoing free radical reactions. Following Hey and Waters (44), benzoyl peroxide is believed to decompose into carbon dioxide and free radicals:

$$(A)\quad C_6H_5-\overset{O}{\overset{\|}{C}}-O-O-\overset{O}{\overset{\|}{C}}-C_6H_5 \longrightarrow 2\ C_6H_5-\overset{O}{\overset{\|}{C}}-O\bullet$$

$$(B)\quad C_6H_5-\overset{O}{\overset{\|}{C}}-O\bullet \longrightarrow C_6H_5\bullet + CO_2$$



Molecular Compound Theory

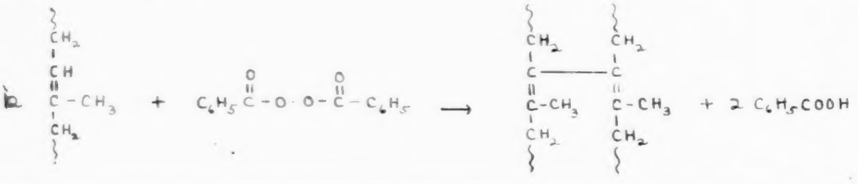
Blake (5) utilized the current knowledge of his time that nitro-compounds could not produce a hard rubber in calculating kinetic data concerning vulcanization. Since then Wright and Davies (87) have prepared hard rubber with nitro compounds, thus weakening the experimental background for Blake's hypothesis. Blake, however, has reiterated his original ideas in a recent address (6). From kinetic data he proposes the following reaction to take place:

Rubber + nitro compound → molecular compound
Molecular compound → vulcanized rubber.

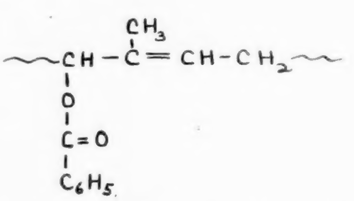
One reason for this conception was that Blake encountered erratic results in nitrogen determinations when various solvents were used (7).

Dehydrogenation Theory

Most theories of non-sulphur vulcanization acknowledge that hydrogen atoms can be extracted from the polyprene chains by the vulcanizing agents. This applies specifically to the mechanisms of peroxide vulcanization as advanced by van Rossem and his associates (71). The simultaneous formation of benzoic acid and the dehydrogenation and cross-linking of rubber are proposed to occur according to:



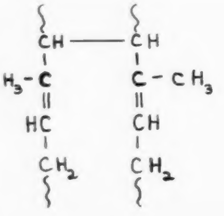
"The benzoate groups doubtless become substitutionally attached at one or the other of the α carbon atoms of the isoprene units, but probably mainly at the α methylene groups adjoining the methylated carbon atoms, thus:



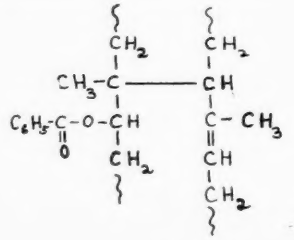
"This substitution will be only of two main results of the reaction with benzoyl peroxide, the second of which will involve the linking together of the rubber chains, probably largely at the alpha methylene groups as in (a)." [Equation at bottom of page.]

Van Rossem believes this cross-linking to be augmented by polymerization.

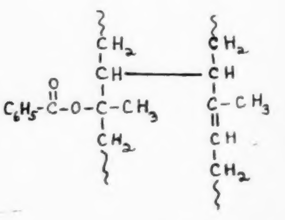
Margitova and Guchkova (51) similarly depict the vulcanization of rubber by p-nitrosodimethylaniline and diazoaminobenzene to be as follows:



(a)



(b)



(c)

An Extended Free Radical Theory

In this section we shall try to formulate a free radical mechanism which seems to be consistent with the observed facts concerning a wide variety of non-sulphur vulcanization reactions and in which the labile alpha methylenic hydrogen atom plays an important role. First, however, it will be appropriate to review some pertinent chemical facts which seem to be characteristic of *organic* vulcanization.

1. Fragments of the reagent can be recovered in the reduced state. Thus hydroquinones (26) and benzoic acid (71) have been recovered from vulcanizates cured by quinones and benzoyl peroxide respectively. In general the yields of these fragments appear to be roughly one-half of the original reagent.

2. Another portion or fragment of the reagent becomes chemically bound to the rubber hydrocarbon. Again this appears to correspond roughly to about one-half of the active agent. Thus, in peroxide vulcanization a polyisoprene benzoate is formed (71).

3. The change in unsaturation appears to be proportional to the amount of combined reagent (8).

In most cases it has not been possible to determine whether the combined portion of the agent is attached to two polymer chains, thus forming an intermolecular bond. In a few cases it was found, however, that the combined reagent does not act as a link between two rubber chains.

It may further be noted that many non-sulphur vulcanizing agents decompose during vulcanization with evolution of a gas.

These facts, together with others which will be reviewed in the later sections, seem to point to the following general mechanism of this reaction:

1. The basic primary step is the removal of one alpha-methylenic hydrogen atom of the rubber.

2. The rubber free radical then attacks an adjacent chain, presumably interacting with one π-electron of the double bond. This leads to the formation of an intermolecular cross-link and a new free radical.

3. Termination is brought about by reaction with a second molecule or molecular fragment of reagent.

The chief differences of this mechanism from one vulcanizing agent to another are in the nature of the initiation step. Vulcanizing agents of types I and III, above, produce free radicals by thermal decomposition or oxidation. These free radicals then remove an alpha methylenic hydrogen. In the case of reagents of type II, the initial reaction with the rubber is an oxidation which proceeds through a free radical stage. Specific illustrations will be provided for all three types of reaction.

It was originally reported that no change in unsaturation occurred during peroxide vulcanization (32). Sometime later, however, Blake and Bruce (8) were able to prove that a definite decrease in unsaturation accompanied the reaction and that the change was directly proportional to the amount of combined reagent.

More recently Farmer and Michael (23) used cyclohexene as a representative low molecular weight analog of rubber. The reaction products with benzoyl peroxide were C_6-derivatives, the dimer, dimer derivatives, benzoic acid, and carbon dioxide. The nature and proportion of the reaction products agree well with the expectations of the free radical mechanism.

The decomposition of benzoyl peroxide may be represented qualitatively as follows:

$$C_6H_5-\overset{O}{\overset{\|}{C}}-O-O-\overset{O}{\overset{\|}{C}}-C_6H_5 \longrightarrow C_6H_5-\overset{O}{\overset{\|}{C}}-O\bullet + CO_2 + C_6H_5\bullet$$

More precisely there is also believed to be some symmetrical fission

$$C_6H_5-\overset{O}{\overset{\|}{C}}-O-O-\overset{O}{\overset{\|}{C}}-C_6H_5 \longrightarrow 2\ C_6H_5-\overset{O}{\overset{\|}{C}}-O\bullet$$

and possibly further decomposition of the aryl acyloxy free radical:

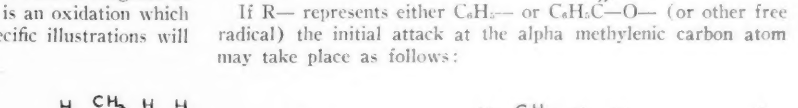
$$C_6H_5-\overset{O}{\overset{/\!/}{C}}-O\bullet \longrightarrow C_6H_5\bullet + CO_2$$

The free benzoic acid and the combined benzoate in benzoyl peroxide vulcanizate account for about 30% of the possible fragments of the reagent. Unfortunately experimental difficulties have thus far prevented analyses for the corresponding products of the aryl free radical, e.g., benzene and the phenyl derivative of polyisoprene. If it were considered essential to isolate or estimate these products, the problem could be approached by the use of halogenated peroxide as vulcanizing agent.

It is very unlikely that vulcanization with benzoyl peroxide is a simple reaction. The poor aging characteristics of peroxide vulcanizates indicate that certain side reactions have occurred. It seems possible, however to postulate the following reactions which might take place with a certain probability:

If R— represents either C_6H_5— or $C_6H_5\overset{O}{\overset{/\!/}{C}}$—O— (or other free radical) the initial attack at the alpha methylenic carbon atom may take place as follows:

Specific Examples of Non-Sulphur Vulcanization



Compounds Which Decompose to Yield Free Radicals

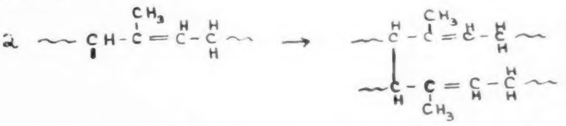
Benzoyl Peroxide. Ostromislensky observed that benzoyl peroxide, peracetic and perphthalic acid (61) are vulcanizing agents and, later, added ammonium persulfate (63) to this list.

Vulcanization with benzoyl peroxide takes place rapidly at around 140° C. (71). The vulcanizates are transformed gradually—often rapidly—into sticky masses unless a second reagent, such as sulphur, is added. If sulphur is used, the rubber-sulphur reaction is very brief owing to inhibition by the benzoic acid formed (71).

Shortly after vulcanization with benzoyl peroxide the surfaces of the rubber becomes covered with transparent crystals of benzoic acid (71). Pursuing this further, van Rossem and his associates removed all free benzoic acid by acetone extraction and found by saponification that an appreciable amount of polyisoprene benzoate is formed during the vulcanization reaction. Further analysis, this time in view of the oxygen theory of vulcanization, revealed that only a trace (< 1%) of oxidation products are formed during the reaction (71).

The removal of an alpha methylenic hydrogen atom as such by the free radical produces a stable molecule RH, e.g., benzoic acid or benzene, at the expense of leaving an odd electron on the isoprene residue.

Reaction of the rubber free radical with a second rubber free radical leading to direct cross-linking of two chains is not likely to occur:

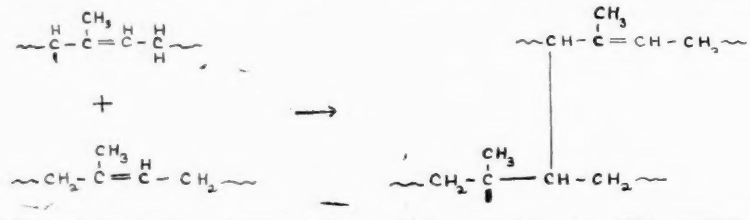


because of the low probability of two active centers attached to such hindering segments being in effective positions for mutual saturation.

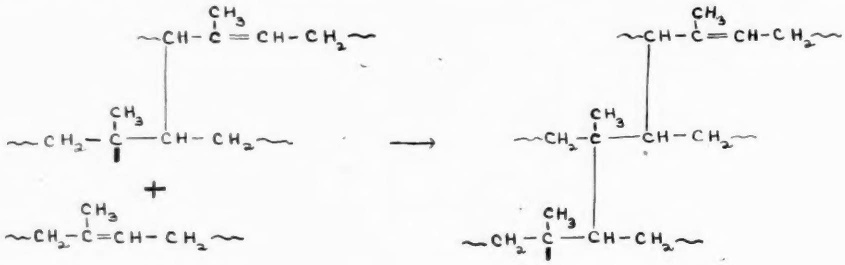
Termination by a second free radical from the vulcanizing agent is possible, but such collision at this time would prevent vulcanization. That is, such a reaction would mutually satisfy

the unpaired electrons of the respective radicals, and the activated rubber segment would be inactivated without becoming cross-linked with another rubber molecule.

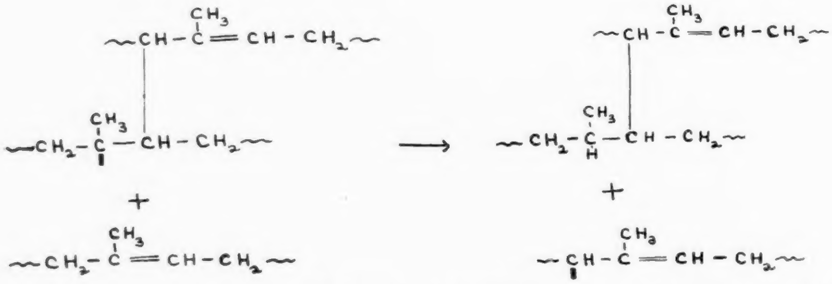
Reaction of the free rubber radical with one of the π electrons of an adjacent segment appears to be another probable step:



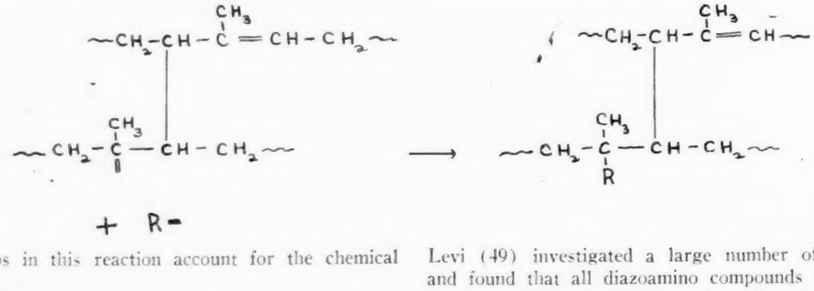
This process may continue in several ways: A sequence of cross-linking through the double bond of additional chains through successive regeneration of odd electrons:



Chain transfer:



Termination through collision with a second free radical from the vulcanizing agent:



The general steps in this reaction account for the chemical data:

(1) Formation of free radicals from the vulcanizing agent through thermal decomposition.

(2) Attack of free radicals at alpha methylenic carbon.

(a) Accounts for formation of free benzoic acid.

(3) Attack of rubber free radical at double bond of a second chain segment.

(a) Accounts for decrease in unsaturation.

(b) Accounts for vulcanization (cross-linking).

(4) Termination of reaction by combination with a second fragment of vulcanizing agent.

(a) Accounts for presence of fragments of agent attached to chain. The order of magnitude is also in agreement with experiment.

(b) Accounts for loss of unsaturation proportional to amount of combined reagent.

(5) The rate of vulcanization is very rapid within the normal range of vulcanizing temperatures. No appreciable changes occur in the chemical or physical properties of the vulcanizate after a very short time. This condition is accounted for by the rapid decomposition of benzoyl peroxide at vulcanizing temperatures and the customary rapidity of chain reactions.

Diazoaminobenzenes. Buizov (13) in 1921 found that diazoaminobenzene acts as vulcanizing agent for rubber. In 1937, Levi (49) investigated a large number of related compounds and found that all diazoamino compounds which decompose at vulcanizing temperatures are vulcanizing agents. He further observed that it was essential that one nitrogen atom be attached directly to the diazo group. This is reasonable since the energy necessary to rupture the N-N single bond (20 k cal/mole) is considerably less than that required for the rupture of the C-N single bond (48.6 k cal/mole) and the probability of thermal decomposition of diazoamino compounds at vulcanizing temperatures would be expected to be greater than that of diazo compounds.

Fisher (32) continued the investigation of these compounds on a systematic basis. He particularly examined the labile hydro-

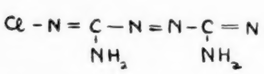
gen of the amino nitrogen to determine its importance in the reaction. He not only found that this was not the point of action, but that even more active vulcanizing agents may be prepared by replacing this hydrogen by a methyl or benzyl group.

Diazoaminobenzene decomposes as follows:

According to the scheme as presented in this article, vulcanization is brought about by the two free radicals formed. Analysis of vulcanizates cured by diazoaminobenzene have been found to contain appreciable amounts of free diphenylamine (76). This indicates that a reaction loosely called dimerization is competing with the vulcanization reaction for the free radicals. Thus:

It would appear that replacement of the hydrogen atom by a bulky methyl or phenyl group would reduce the number of effective collisions of the two free radicals and hence increase the probability that reaction with the rubber will take place.

N,N'-Dichloroazodicarbonamidine. Fisher (26) found that this reagent,



brought about vulcanization. It is of interest primarily because of its aliphatic nature. It breaks down at vulcanizing temperature with evolution of nitrogen.

Diazonium Salts. Diazonium salts decompose into free radicals at temperatures well below room temperature. Levi (49) reports, however, that benzene diazonium chloride does not bring about vulcanization. Consideration of the length of time during which the salt is held at room temperature during milling of the material and during its preparation for vulcanization casts considerable doubt as to whether any benzene diazonium chloride as such is present during the curing operation.

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(*To be continued*)

Rubber Trade in France

Normally France would now be importing about 70,000 tons of rubber, and since French Indo-China's prewar production was about 60,000 tons of rubber annually, that former French possession would by now have been capable of supplying all of France's crude rubber requirements. However until Indo-China, now occupied by the Japanese, is liberated and is able to ship out rubber again, France will have to depend on imports from other sources. But, say reports from Paris, it is not intended to rely on imports; on the contrary, synthetic rubber is to be produced, and it is expected that with American assistance a synthetic rubber industry will be rapidly developed.

French rubber manufacturers are making great efforts to increase production of rubber goods, and reports indicate that some progress has been made since the liberation. Output in March is said to have been 38% of monthly production in 1938, against 16% for February, 1945.

Much more rapid headway would by now have been made if several large rubber factories had not been seriously damaged, if ample supplies of raw material were available, and last, but not least, if transportation as well as operations were not hampered by a coal situation that seems to be steadily deteriorating. Since the recent nationalization of mines, production of coal has been falling rapidly, it is said, and it is feared that unless there is an improvement shortly, France faces a grave coal crisis next winter.

Hutchinsons, a well-known manufacturer of all kinds of rubber goods, says that far larger quantities of tires could easily have been produced if it were not for the coal situation.

On the other hand, a French Dunlop report is rather optimistic. At a recent meeting of the company, the chairman, M. A. Dutreux, stated that reconstruction on the bombed factories at Montlucon and Le Bourget is progressing favorably. Furthermore the government has enabled the company to obtain necessary raw materials, and production, already increasing, is expected to show decided improvement very soon. Incidentally, the destruction of the factories has cost the company 61,866,295 francs.

The Wolber concern has begun to produce bicycle tires again.

Factors Affecting Results Obtained with the Mooney Viscometer[1]

Rolla H. Taylor[2]

STUDIES of the results obtained with Mooney viscometers in measurements of viscosity of synthetic rubbers indicate the need of better and more definite instruction of operators of such viscometers. Recent reports of tests made on standard bales of raw GR-S at 18 different laboratories show that readings for individual tests vary over a range of approximately 12 units and that averages obtained by the different laboratories vary over a range of 4.5 units. If suitable precautions are taken, individual values from different laboratories need not vary by more than three units, and the average values from the different laboratories should vary by less than one unit.

In order to attain this degree of agreement in different laboratories it is most essential that precautions be taken in caring for and adjusting Mooney viscometers with respect to the following five items: (1) The machine must be clean; particularly, there must be no rubber in the bearings on the vertical shaft. (2) The machine must be mechanically calibrated to rigid specifications. (3) The dies, die holders, and rotors must be of specified dimensions. (4) The die closeures must be carefully adjusted to rigid specifications. (5) The test pieces used in the machine must be carefully prepared and selected for accuracy of dimensions and freedom from air. A well-constructed machine with all operating parts machined to proper tolerance is, of course, implied.

This paper describes the precautions which must be taken and the methods of adjustment which must be followed if uniformity in the values of Mooney viscosity is to be obtained on the same samples with different viscometers and in different laboratories. The variations which may result, if the outlined procedures are not closely followed, are discussed.

Effects of Inadequate or Infrequent Cleaning of the Mooney Viscometer

It is of the utmost importance that certain parts of the Mooney viscometer be kept absolutely free from rubber at all times. Results obtained from tests made on machines which have rubber in the bearings can never be depended upon, and tests made on machines operated with the serrations on the dies and rotors clogged with rubber are very likely to give erroneous results.

Effects of Rubber around the Top of the Vertical Shaft

In "AA" and earlier model viscometers by far the most important cleaning operation and the one which has been the hardest to bring to the realization of Mooney operators is the removal of rubber from around the top of the vertical shaft. (See Figure 1 for location of parts.) The lower die should be removed, and the rubber, which has leaked past the rotor stem, cleaned out before it can be forced into the top bearing or before it can work itself into the top bearing. No definite rule can be established for the regularity with which this cleaning operation should be performed because of the variables involved. The amount of rubber which will leak past the rotor stem will depend on the clearance between the rotor stem and the lower die and upon the plasticity of the rubber being tested. The amount of rubber which can safely be permitted to leak into the chamber at the top of the vertical shaft before cleaning depends chiefly on the clearance between the top of the vertical shaft and the bottom of the lower die.

Many people in replacing the bronze bearing in the upper part of the housing have not realized the importance of this clearance and have left the bearing too long so that the clearance was reduced to less than 1/16-inch. In fact, one case was encountered in which it was so small that not more than one test could be made without obtaining erroneous results. The original design calls for a clearance of ⅛-inch. It is recommended that it be not less than 3/32-inch on any machine. It should be borne in mind also that it is desirable to have the top of the vertical shaft as high as practicable in order to give the necessary support to the rotor.

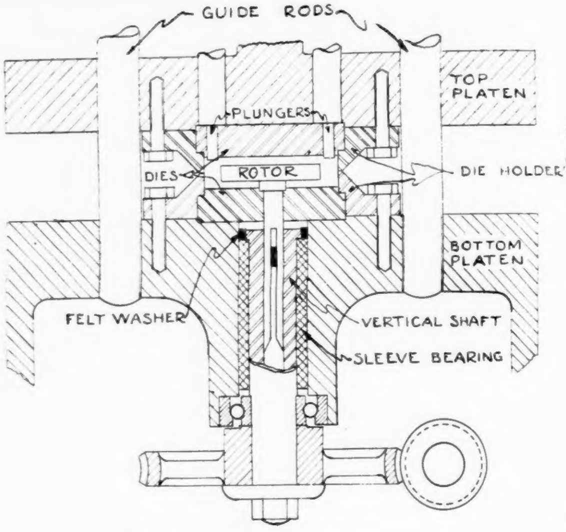


Fig. 1. Section of Mooney Viscometer

A well-oiled felt washer at the top of the vertical shaft has been found quite helpful in preventing the rubber from working its way into the bearings. Some laboratories have not found these washers to be of any help simply because their cleaning periods were so infrequent that rubber was forced into the felt washer and destroyed it as well as its usefulness. Proper cleaning and oiling permitted the use of one felt washer at the National Bureau of Standards for a period of more than six months without the necessity of removing it or the vertical shaft.

Normally a small amount of rubber leaks past the rotor stem each time a test is made. Assuming sufficient clearance between the top of the vertical shaft and the lower die, this rubber will lodge on the top of the shaft without affecting the viscometer reading. As rubber is forced into the space between the die and the shaft, it will be rolled between the two without materially affecting the results. Then, as still more rubber is forced past the rotor stem, it will completely fill the space between the die and the shaft and will finally be forced down into the bearing. Should this happen, the only way in which the machine can be properly cleaned is by removing the vertical shaft and cleaning thoroughly both the shaft and the bearing. If this is not done, the results at best are bound to be unreliable.

Mechanical calibration designed to compensate for the increased friction due to the rubber in the bearing should never be tolerated. In most cases where this is done, high values of viscosity will be obtained because the increased pressure due to additional leakage of rubber during a test increases the friction still more. The errors resulting from this condition have been found to be as much as six units.

Where the felt washer is not used at the top of the vertical shaft, any rubber which leaks past the lower die is likely to find its way into the bearing, and it is never certain just how much the results are being affected by this condition.

The only way in which to be sure that the results are not affected is to have a felt washer at the top of the shaft, keep it well oiled, and, above all, remove the lower die and clean out the rubber before it has been forced into the felt. Approximately ten minutes are required to remove the lower die, clean out the rubber, oil the felt, and replace the die. On the other hand two hours or more are required to remove the vertical shaft and per-

[1] This article will also appear as a publication of the National Bureau of Standards in the near future—Circular C451.
[2] Rubber Section, National Bureau of Standards, Washington, D. C.

form the necessary cleaning operation after rubber has been forced into the bearing, and it is never certain just when the excess rubber begins to affect the readings.

The design of the new NBS model Mooney viscometer alleviates some of the difficulties of cleaning required in the earlier designs by increasing the size of the cavity at the top of the vertical shaft, by using a better bearing shield at the top of the shaft, and by using a sealing washer in the lower die. This construction does not mean that rubber leakage through the lower die has been eliminated, or does it mean that cleaning is no longer necessary. The frequency of cleaning, however, has definitely been decreased. Oil at the top of the shaft is not recommended for NBS models, but otherwise the above discussion applies to these models as well as to others.

Effect of Rubber in the Serrations of the Dies and Rotors

It is highly important that rubber which sticks to the dies and rotors and fills the serrations of these parts should be removed before proceeding with the next test. The greatest errors will be experienced when a test on rubber of low viscosity is followed by one of higher viscosity. The error is caused by shearing of the rubber which remains in the dies and on the rotor near the surface of these parts rather than shearing of the sample itself. Insufficient data are available to show the extent of such error, but low readings have been observed in cases where the operator has failed to clean the rubber from the serrations on the rotor and in the die cavity.

Effect of Rubber around the Plungers

The frequency with which the plungers require cleaning depends on the clearance between the plungers and plunger holes in the top die, the kind of samples being tested, and the precautions taken to keep the plungers from becoming clogged. Rapidly working the plungers up and down several times after every few tests will tend to keep them free and in good working order. In fact if this procedure is performed regularly, the viscometer can be operated continuously for weeks without having to remove the plungers for cleaning.

Inoperative plungers will cause the viscometer reading to be low. Where there is no plunger action at all, the error introduced may be as much as three units.

Oil should never be applied to the plungers because it causes the rubber which leaks past the upper die to become sticky and more difficult to remove from the plunger parts.

Mechanical Calibration

Mechanical calibration of Mooney viscometers, although somewhat tedious, is a straightforward procedure which should not give undue trouble. It is nevertheless a very important step which must be taken to insure correct readings of viscosity.

There has been considerable discussion as to whether it is sufficient to calibrate viscometers at the normally specified reading of 100, or whether they should be calibrated at or near the reading which will be obtained from the rubber tested. Actually it makes no difference as long as the U-spring is not stressed beyond its elastic limit since the calibration curve for the U-spring will then be a straight line. A few cases have been found where an error was introduced as a result of permanent set taken by the U-spring when rubbers having a high viscosity were tested. This means that in these particular cases the spring was stressed beyond its elastic limit. Consequently the results would not be dependable regardless of the point at which the calibration was made. Any U-spring designed for use on the viscometers which does not give a straight line relation between load and deflection should not be used.

Effects of Dimensions of Dies, Die Holders, and Rotors

The dimensions of the die cavity and the dimensions of the rotor head are very important from the standpoint of attaining uniform results with different Mooney viscometers.

Dr. Mooney[3] gave the following equation for the Mooney viscometer reading in terms of constants for a particular instrument and the average viscosity of the sample being tested.

$$G = \frac{\eta_m}{181.44gP}\left(\frac{4\pi\Omega}{a}\int_O^R r^3dr + \frac{2\pi hR^3\Omega}{b}\right)$$

which may be reduced to

$$= \frac{2\pi\eta_m\Omega R^3}{181.44gP}\left(\frac{R}{2a} + \frac{h}{b}\right) \qquad (1)$$

where all the terms are expressed in c.g.s. units and

G = Gage reading
η_m = Average viscosity
Ω = Angular velocity of rotor in radians/sec.
g = Gravitational acceleration
P = Pitch radius of worm gear
R = Radius of rotor
a = Vertical clearance between rotor and stator above or below the rotor
h = Thickness of rotor
b = Effective radial clearance between rotor and stator

Effect of Dimensions of Rotors

For the purpose of calculating the effect of sizes of rotor on the viscometer reading, we may assume the average viscosity (η_m) to be a constant which will give a gage reading of 50 for rotors and dies of specified dimensions. Then since g, P, and Ω are constant, we may write:

$$G = KD^3\left(\frac{D}{4a} + \frac{h}{b}\right) \qquad (2)$$

where K is a constant, D is the diameter of the rotor, and D, a, h, and b are all measured in inches. Now since the inside diameter of the die holder is to be 2.000 inches, and the total depth of the chamber is to be 0.418-inch, we may write:

$$a = \frac{0.418 - h}{2} \qquad (3)$$

and by Dr. Mooney's reasoning:

$$b = \frac{1}{2}\left(\frac{3}{2}a + \frac{2.000\text{-}D}{2}\right) \qquad (4)$$

to a close approximation.

If we now assume values for D and h and calculate G, the curves shown in Figure 2 are obtained. Thus we see that the viscometer reading for the sizes of rotors considered will vary at the rate of approximately 0.25 unit per 0.001-inch change in thickness of the rotors and approximately 0.15-unit per 0.001-inch change in the diameter of the rotor.

In order to check the theory presented above, tests on Vistanex were made with four available rotors, and the results compared with the calculated value for each rotor. These comparisons are shown in Table 1.

TABLE 1. EFFECT OF ROTOR DIMENSIONS ON VISCOMETER READING

	Rotor No. 1	2	3	4
Rotor dimensions, in inches:				
Diameter (D)	1.502	1.502	1.507	1.510
Burr diameter*	....	....	1.516	1.518
Thickness (h)	0.220	0.221	0.219	0.226
Viscometer reading:				
Sample 1				
Observed value	49.5	51	52	53
Calculated value based on:				
(1) Diameter	....	49.8	50.0	52.2
(2) Burr diameter	....	....	51.4	53.5
Sample 2				
Observed value	55.5	55.5	57	58.5
Calculated value based on:				
(1) Diameter	....	55.8	56.1	58.5
(2) Burr diameter	....	....	57.6	60.0

* Burrs were formed at the corners of the rotor during the chromium plating operation. The burr diameter is taken as the maximum diameter of the rotor including the burrs.

For purposes of calculation, 49.5 and 55.5, the values obtained with rotor No. 1, were assumed to be the correct gage readings for rotor No. 1 and were used in calculating the constant K in equation 2 and the expected results for rotors Nos. 2, 3, and 4.

[3] A Shearing Disk Plastometer for Unvulcanized Rubber," Melvin Mooney, *Ind. Eng. Chem., Anal. Ed.*, 6, 2, 147 (1934).

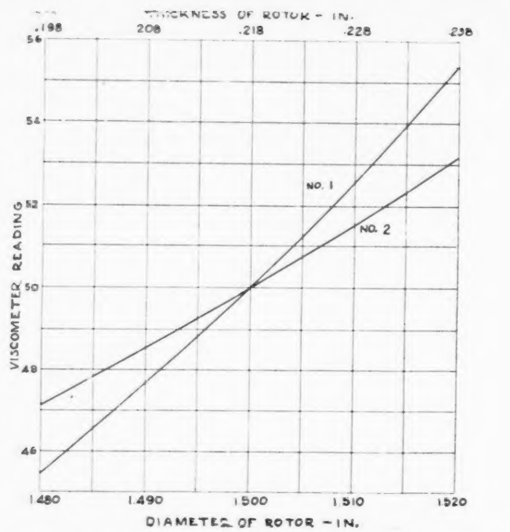


Fig. 2. Calculated Effect of Thickness and Diameter of Rotor on Viscometer Reading; Curve No. 1, Thickness; Curve No. 2, Diameter

It should be noted that the calculated gage reading is related to the effective values of D and h, and that these may or may not be the same as the measured values. This is particularly true where the rotor has burred edges, as was the case with rotors Nos. 3 and 4.

Effect of Dimensions of Die Cavities

Changes in the depth and the inside diameter of the die holders affect the gage reading insofar as they affect changes in the values of a and b, respectively. If the rotor head is assumed to be 1.500 inches in diameter and 0.218-inch thick and the dimensions of the die cavity are permitted to vary, equations 3 and 4 become.

$$a = \frac{T - 0.218}{2} \qquad (5)$$

and

$$b = \frac{1}{2}\left(\frac{3}{2}a + \frac{d - 1.500}{2}\right) \qquad (6)$$

where T is the total depth of the die cavity, and d is the diameter of the cavity. From an analysis of equations 2, 3, 4, 5, and 6, it can be shown that the change in the viscometer reading with an increase in T is essentially equal to the change in reading resulting from a decrease in h equal to the increase in T, and *vice versa*. The change in reading is approximately 0.25-unit per 0.001-inch change in the total depth of the die cavity; while the change in reading resulting from a change in the diameter d is only about 0.15-unit per 0.010-inch change in d. It will be noted from equations 2 and 6 that the effect of changing the inside diameter (d) of the die cavity is much less than the effect of changing the diameter (D) of the rotor.

Since the variations in the dimensions of the rotors studied are not so great as those encountered in different plants, the variations in viscometer readings shown in Table 1 are not so great as those present in actual practice. However they do indicate the conformance of observed data to theory, and the curves shown in Figure 2 indicate the importance of using only those rotors, dies, and die holders which conform to the specified dimensions. The dimensions and tolerance usually recommended are given below as a matter of interest:

ROTOR:					
Head diameter	1.500	+	0.001	—	0.001 in
Head thickness	0.218	+	0.001	—	0.001 in.
DIES:					
Total thickness	0.509	+	0.000	—	0.001 in.
Thickness from bottom to shoulder	0.406	+	0.000	—	0.001 in.
DIE HOLDERS:					
Thickness from shoulder to closing face	0.312	+	0.000	—	0.001 in.
Inside diameter	2.000	+	0.010	—	0.000 in.

Effect of Position of Rotor Head

The Mooney viscometer readings are affected not only by the dimensions of the die cavity and the rotor, but also to some extent by the position of the rotor in the die cavity. It is intended that the rotor head shall operate in the exact center of the die cavity. In the A and AA model viscometers, however, it is impractical, if not impossible, to maintain the rotor in this position because of the rapid wear which takes place between the shoulder on the rotor stem and the lower die. This difficulty is not present in the NBS model. As long as the dimensions of the various parts are such that the rotor will be properly positioned to begin with, one can be reasonably sure that the correct position will be maintained.

The rotor head can be off the central position by 0.01-inch without materially affecting the results. But no more than 0.01-inch should be permitted. Where the rotor is off center by 0.03- or 0.04-inch, the viscometer readings may be increased by two or three units. A very practical way to check the position of the rotor is to compare the thickness of the cross-sections of the portions of the test piece from above and below the rotor.

The curve in Figure 3 shows the effect of displacing the rotor head from the central position of the die cavity. This curve was calculated from equations 2, 3, and 4 given above and correlates reasonably well with experience.

Adjustments

Correct adjustment of the die closure is without doubt the most difficult to attain of the five items discussed in this paper. It has not been found possible to set forth a method of adjustment which is free from the personal factor, nor has it been possible to convince all operators of the importance of careful adjustment. Several different methods of adjustment have been tried, none of which is entirely satisfactory. Considerable progress has nevertheless been made.

Correct adjustment of the die closure is considered to be a condition such that when the mating surfaces of the die holders are forced together, there will be a uniform pressure at all points between the two surfaces. The pressures will not be great enough to cause undue strain in any of the parts, and yet the pressures will be great enough to eliminate practically all of the leakage from the die cavity between the closing surfaces. The following method is suggested for making this adjustment.

Adjustment of Plungers and Dies

Replace the upper die and plungers, being careful to aline the die with the plungers. Place the die holder (TD in Figure 4) over the die and hold it firmly in place while applying the four cap screws which hold the die holder and die in place, being careful to tighten opposite screws evenly. Do not tighten the cap screws too much. Just bring them up snug.

If the plungers do not operate freely after the die and the plungers have been tightened in place, loosen the studs in the die holder and in the plunger clamp and shift them into a position that will permit the plungers to operate freely.

Check the operation of the plungers by rapidly raising and releasing the plungers several times. (Recheck the operation

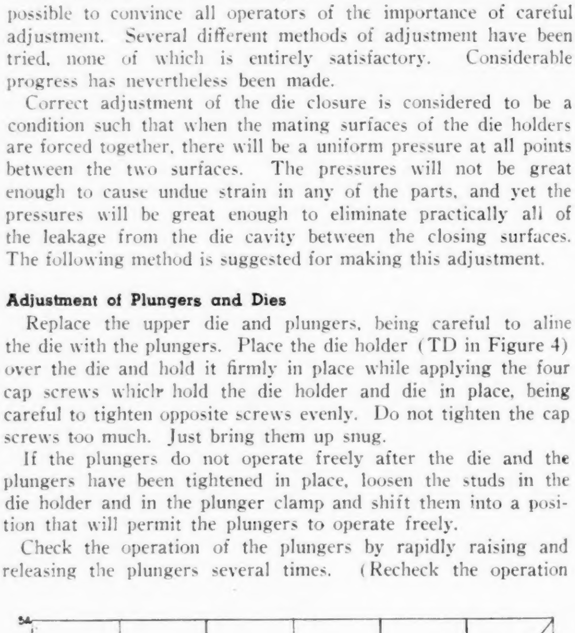


Fig. 3. Calculated Effect of the Vertical Displacement of Rotor in the Die Cavity

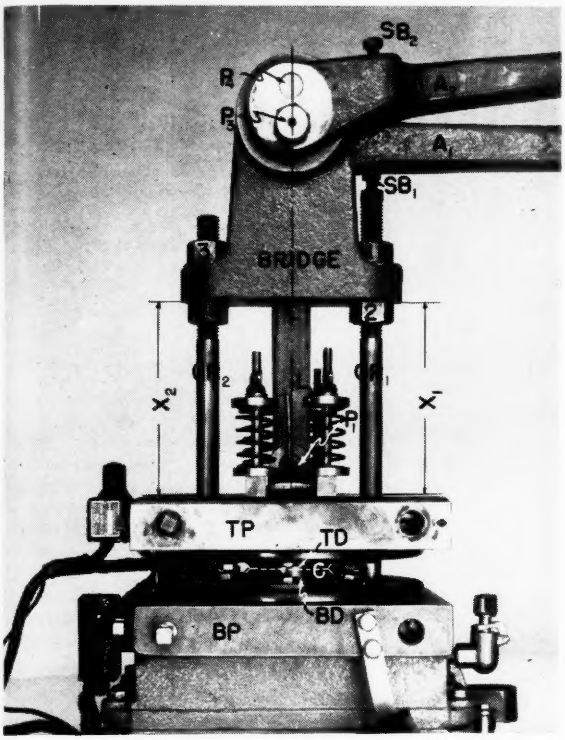


Fig. 4. Mooney Viscometer

of the plungers frequently throughout the day, since they tend to pick up rubber and become inoperative very quickly, especially when compounded samples are tested. Clean them whenever necessary, as indicated on page 583.)

Oil the felt washer around the top of the vertical shaft in Models A and AA, as outlined on page 582. Replace the lower die. Start the motor, insert the rotor, and aline the die by shifting it to the position at which the magnitude of the periodic fluctuations of two per minute is a minimum. Place the die holder on the die, and tighten the four cap screws as was done on the upper die, being sure that the fluctuations are not increased by this operation.

Make a pattern of the die closure (C) by placing a piece of thin (not thicker than 0.0015-inch) soft tissue paper between the dies and closing the machine. Adjust the four cap screws in the die holders until a continuous pattern of uniform intensity is obtained. Do this by tightening the cap screws adjacent to the part of the die holder which produced a pattern of high intensity, and loosening those adjacent to the part which produced a pattern of low intensity. Figure 5 shows a good die holder pattern and examples of poor patterns. If a perfect pattern cannot be obtained in this manner, remove the four cap screws from the lower die holder (BD, Figure 4), turn the die holder one-quarter turn and proceed as before. If, after trying each position of the die holder, a pattern of uniform intensity has not been obtained, replace the die holder with a new one. To aid in relocating the correct position of the die holders when replacing them after cleaning, place a reference mark on them.

Adjustment of Platens

Make the following adjustments, with the platens at the temperature of the test:

(1) Adjust the position of the bridge so that the distances X_1 and X_2 in Figure 4 are equal when the dies are closed, by adjusting the guide rod nuts 1, 2, 3, and 4 on guide rods GR_1 and GR_2.

(2) Adjust the position of the link (L) which connects the top platen (TP) with the lower lever arm (A_1) so that the link is on dead center when the dies are closed; i.e., so that the four pins P_1, P_2 (not shown—connects L with A_1), P_3 and P_4 all lie on the same center line. Do this by adjusting the stop bolts SB_1 and SB_2. Turn the stop bolt (SB_1) out of the guide rod (GR_1) to swing the link forward at the top. Turn the stop bolt (SB_2) out of the lever arm (A_2) to swing the pin P_3 toward the back and the pin P_4 toward the front of the machine.

(3) Mark the position of two adjacent corners of the hexagon nuts 1 and 3 on the bridge with a pencil for reference. In all subsequent adjustments involving the nuts on the guide rods GR_1 and GR_2, loosen nuts 2 and 4; then make the necessary adjustments by turning nuts 1 and 3. Be careful to turn both nuts exactly the same amount with reference to the pencil marks placed on the bridge, and then tighten nuts 2 and 4. Place four springs between the platens, one at each corner. The plunger springs originally supplied on the first AA models are suitable. If these are not available, similar springs may be made by winding ⅛-inch spring wire on a 0.665-inch diameter rod. The finished spring should be about 2⅝ inches long and have a ⅜-inch pitch. Adjust the height of the bridge so that after the top platen has been raised and lowered with the springs in place, a 0.002-inch feeler gage can just be passed between the closing surfaces of the die holders at some one point, but so that a 0.004-inch feeler gage cannot be passed between the die holders at any point. Loosens nuts 2 and 4. Turn nuts 1 and 3 down exactly 1/12 turn (½ of one face of the nuts), and tighten nuts 2 and 4 to give the correct die pressure.

(4) Recheck items (1) and (2) above. Also check the die pattern as described in section 1 above. Make further adjustments if necessary. If it is found necessary upon rechecking to adjust for items (1) and (2), make readjustments as specified in item (3).

Adjustment of the die closure made as outlined above will produce a total deformation of parts of from 0.004- to 0.006-inch which is distributed throughout the dies, die holders, platens, guide rods, connecting link, bridge, and lever system. The amount of this deformation is determined by the adjustments and the fact that the guide rods have 11 threads per inch. Thus the bridge will be raised or lowered 0.091-inch per turn of nuts 1 and 3. Then since all play in the pins P_1, P_2, P_3 and P_4 is assumed to be taken up by the action of the springs between the platens and since the bridge and upper platen assembly will be moved down approximately 0.008-inch by turning nuts 1 and 3 down 1/12 turn, the difference between 0.008-inch and the clearance between the mating surfaces (0.002- to 0.004-inch) will be from 0.004- to 0.006-inch, and this must be accounted for by actual deformation of parts.

It is difficult to show a direct correlation between viscometer readings and the amount of deformation which would be required

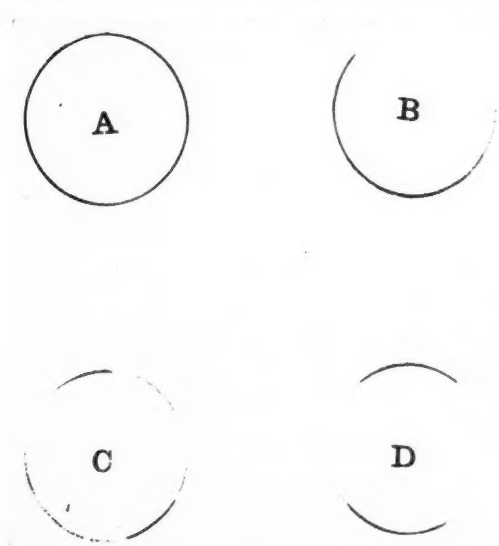


Fig. 5. Typical Patterns of Die Closures: (A) Good Die Pattern; (B) Poor Because of Cocked Die Holder; (C) Poor Because of Badly Warn Die Holder; (D) Poor Because of Non-Uniform Tightening of Die Holder or Inequality in Thickness around Die from Bottom to Shoulder

to take place by a particular adjustment. It is well known, however, that as the die closure becomes looser, the reading will decrease, and, as it becomes tighter, the reading will increase. It is not definitely known whether the increased reading in the latter case is due to increased pressure on the test piece or increased friction in the machine due to deformation of parts. Probably the reading is influenced by both. As the closing pressures are decreased, the reading will be influenced principally by the amount of the leakage which takes place. Actual cases have been observed where maladjustment of the die closures resulted in errors of plus or minus five units, depending on whether the closures were too tight or too loose. It should also be noted that even though the pressure on the die closure is too high, the reading may be low in cases where a badly worn die holder or poorly adjusted die holders permit undue leakage.

Preparation of Test Pieces

The value of viscosity obtained for a given material is dependent not only on the condition of the viscometer, but upon the preparation of the test piece as well. The test pieces should be not less than 3/8-inch thick so that one test piece below the rotor and one above the rotor will completely fill the die cavity with sufficient overflow to force the rubber into the corners of the die cavity and to force out as much air as possible. The test pieces should also be as free from air as it is practical to make them, and they should be free from pockets which may trap air against the rotor or die surfaces. Furthermore the test piece placed below the rotor should have a hole punched through its center and slipped over the rotor stem. Test pieces should never be cut and slipped around the rotor stem. The latter method frequently traps air in the die cavity. The statement has been made that air works out of the test piece and escapes through the plunger holes during operation of the machine. The writer has observed, however, that very little, if any, air escapes from the die cavity once the test piece is in the machine and the dies are closed. Normally part of the trapped air will be absorbed by the specimen, and the remainder will collect in small pockets near the center of shear. This may be readily verified by observing the cross-section of test pieces which contained considerable air at the time they were placed in the machine. Air in the test pieces may lower the whole viscosity time curve by one unit or two units and will usually cause a much greater drop during the first two minutes of operation.

With the exception of GR-I and possibly GR-M, suitable test pieces seldom can be prepared directly from bales of rubber obtained commercially. Some milling is required to eliminate at least part of the air and to knit the sample together. It is important, however, that rigid specification for milling be followed in order to get reproducible results between samples of the same material. In general the Mooney viscosity is quite sensitive to milling, particularly during the first part of the milling operation. Figure 6 shows the effect of milling on the Mooney viscosity for natural rubber, GR-M, GR-S, and GR-I.

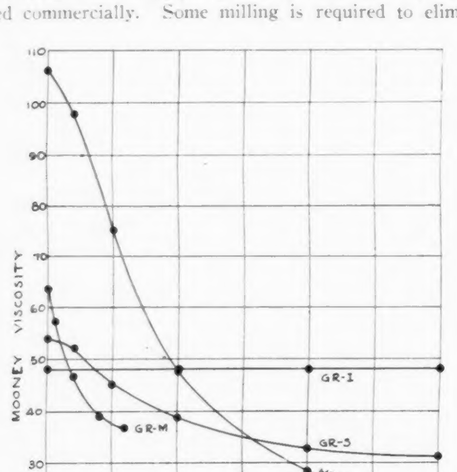


Fig. 6. Effect of Time of Milling on Viscosity of Different Rubbers

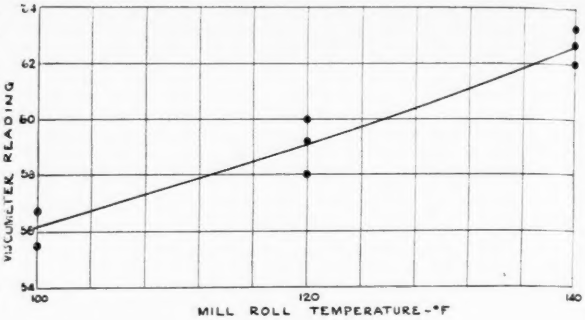


Fig. 7. Effect of Temperature of Mill Rolls during Compounding on Viscosity of GR-S

In testing compounded stocks not only the extent of milling, amount and kind of compounding ingredients will affect the viscosity, but also the mill temperature. Figure 7 shows the relation between Mooney viscosity and mill roll temperature for X-179 GR-S compounded in accordance with the specification for GR-S issued by the Rubber Reserve Co.

Summary

The factors discussed in this paper do not by any means cover all that might be written on the care and operation of Mooney viscometers. It has been assumed that such things as periodic fluctuations, general overhaul, and detailed specifications for parts and adjustments have been adequately covered in the manuals issued by the manufacturer of the viscometer and by the Rubber Reserve Co. It is hoped that this discussion of the cleaning, calibration, dimensions, and adjustments of the viscometer and the preparation of the test piece together with the errors which are likely to result, if correct practices are not followed, will lead to more uniform results and a better understanding of the operation of the machine.

"We Had to Have Rubber." The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y. 64 pages. This booklet is a report to the nation, and particularly to the 150,000 men and women who left jobs in the rubber factories to don fighting uniforms, of the multi-billion dollar contribution of the rubber industry to the war effort. The story is told in pictures and drawings which explain the type and amount of rubber used by the United States before and after Pearl Harbor, and the severe service requirements met by the new synthetic rubbers at the various theaters of operations. The booklet concludes with a reminder of the many needs of the home front for rubber during the war period that also had to be satisfied. The booklet is divided into sections on tires, mechanical goods, hard rubber, rubber footwear, heels and soles, coated materials, rubber sundries, and rubber for the home front. At the beginning of each section is a drawing explaining the amount of rubber or number of products that have been provided. The illustrations then show the airplanes, trucks, jeeps, hose, fuel tanks, footwear, rubber boats, and oxygen masks in the actual performance of their part in the war against Germany and Japan. President A. L. Viles, of the Association, in a statement accompanying the booklet emphasized that "The full measure of the industry's achievement is clear in the amazing production records that are brought together here to show the nation's absolute dependence upon rubber in its wartime as well as in its peacetime economy."

Studies of Hevea, Castilloa, and Cryptostegia Latices—I[1]

Surface Composition of Latex Particles Electrophoretically Determined . . . .

William Seifriz[2]

THE surfaces of latex particles, and of natural emulsions in general, are usually assumed to be protein in composition, with fat or other non-protein material occasionally present. Moyer,[3] in his excellent electrophoretic study of species relationships in *Euphorbia*, found the surface of the latex particles to be protein in some species, part protein in others, and primarily non-protein in others. He[4] also found the surface film on milk globules to be a complex of phospholipids and a protein which is not casein. Among industrial chemists the assumption that protein is the stabilizing material in latex is pretty well established.[5] This last assumption is given additional support by the isoelectric points of not only latex particles, but of bacteria, blood cells, and like suspensions, when they are electrophoretically studied, all prove to have protein coverings.

Without departing from the general and fully justified opinion that electrophoretic behavior is primarily a question of protein behavior, the conclusion reached in the present paper indicates that the surface of some latex particles is, in part, of non-protein, certainly non-ionizable, material. In some species the non-protein portion may be very great.

Materials and Method

The latices which served as material in the present work were those of *Hevea brasiliensis*, *Castilloa elastica*, and *Cryptostegia grandiflora*. The latex was studied on the plantations where the trees were growing; all observations were made within a few minutes after the latex was collected, unless otherwise stated.

The method is that familiar to all workers in electrophoresis.[6] It involves the microscopic observation of the migration of individual particles. Slight modifications in technique were necessitated by the exigencies of a field laboratory. The glass chamber was made from microscope slides and cover slips, and measured 7.5 centimeters in length, 2.5 centimeters in width, and 2.0 millimeters in depth. Salt bridges led from the chamber to electrodes of zinc sulphate and zinc metal. All readings were made at a level of 0.21 of the total depth of the chamber.[7] The voltages available were 125, 170, 200, and 350.

The majority of studies on the surface composition of emulsion globules has been based on the electrophoretic migration of the globules suspended in one type of buffer mixture. The present study departs from this practice by using buffers of different ionic species.

Experimental Data

Migration Studies with Latices

The first unexpected discovery was the feeble charge on *Cryptostegia* particles as compared with that on *Hevea* particles. *Castilloa* was intermediate. The charge on *Cryptostegia* particles was so slight that it was necessary to use a voltage of 350 in order to obtain good migration; whereas 170 volts were sufficient for *Hevea*. Determination of the magnitude of the surface charges on the particles was not possible as there were no means for calibrating the electrophoretic chamber. However comparative values of the relative rates of travel of the three latices, and milk, can be given. At pH 6.8, and in an electric field of 350 volts, the rates of migration in μ per second, averaged 86 for *Hevea*, 62 for milk, 48 for *Castilloa*, and 20 for *Cryptostegia*, which is a 9-6-5-2 ratio.

The foregoing relative rates of electrophoretic migration indicate pronounced differences in the magnitude of the charge and therefore in the chemical composition of the surface of the latex particles. The surprisingly feeble charge on the *Cryptostegia* particles indicates that the proportion of protein in their surface layers is small; the higher charge on *Hevea* particles points to a greater proportion of protein in their surface layer. It has been frequently reported that the surfaces of particles are primarily or wholly non-protein, as in the case of some bacteria which do not migrate at all in an electric field. In spite of such occasional findings, and the feeble charge on *Cryptostegia* latex particles reported here, isoelectric points give support to an, at least in part, protein layer.

Table 1 gives three representative series of readings, one for each of the three latices, and one additional series of values for *Cryptostegia* particles in the latex serum. The figures are of pH values, rate of migration in μ per second, and the sign of charge: thus in *Hevea* at pH 10.5 the latex particles are negative and migrate to the anode at the rate of 86 μ per second in a field of 125 volts.

TABLE 1. ELECTROPHORETIC MIGRATION RESULTS

***Hevea* (125V)**

Buffer = KH_2PO_4—NaOH, KHphthalate—HCl

pH	10.5	9.0	8.5	6.9	5.9	5.5	4.7	4.3	3.7	3.6	3.5	3.2	3.0	2.6
rate	86—	57—	34—	19—	16—	13—	10—	12—	±	2+	17+	16+	24+	40+

Cryptostegia (350V)

Buffer = KH_2PO_4—NaOH, KHphthalate—HCl

pH	9.2	7.6	6.6	6.3	5.8	5.2	4.5	4.3	4.2	4.0	3.9	3.8	3.5
rate	57—	43—	34—	28—	25—	22—	16—	12—	10—	9—	±	14+	17+

Natural Serum (Pure)

pH	5.0	4.9	4.1
rate	43—	34—	9—

Natural Serum (HCl Added)

pH	4.9	4.4	4.2	3.9	2.9
rate	28—	14—	17—	9+	34+

Castilloa (125V)

Na acetate, acetic acid

pH	6.5	5.5	5.0	3.7	3.6	3.4	3.0
rate	86—	57—	34—	22—	11—	25+	34+

In Table 2 appear the isoelectric points for each species of latex in three or more buffers and unbuffered HCl and NaOH. The phosphates were of 0.2M, the acetate and all acids were of 0.1M concentration. The latex buffer ratio was 1:200. Determinations of pH were made with a Beckman potentiometer. KH_2PO_4—NaOH and KHphthalate—HCl are, of course, two sep-

[1] This work was done in Haiti under the auspices of the Société Haitiano-Américaine de Développement Agricole. The author wishes to express his gratitude to T. F. Ford, John Curtis, George van den Berghe, and Lucien Jeanty in Haiti, and George Clough in Philadelphia, for their helpful suggestions and courteous cooperation.

[2] University of Pennsylvania, botanical laboratory, Philadelphia, Pa.

[3] *Amer. J. Bot.*, 21, 293 (1934).

[4] *J. Biol. Chem.*, 123, 29 (1940).

[5] K. Memmler, "The Science of Rubber", p. 98, Reinhold Publishing Corp., New York (1934).

[6] H. A. Abramson, L. S. Moyer, and M. H. Gorin, "Electrophoresis of Proteins", Reinhold Publishing Corp. (1942).

[7] W. Seifriz, "Protoplasm", p. 363, McGraw-Hill Book Co., New York (1936).

arate buffer mixtures used independently, but giving jointly a complete pH range from pH 1.5 to 11. NaOH was added to the NaH_2PO_4-citric acid and the Na acetate-acetic acid buffers in order to carry them up to higher values, above pH 4.6 in the former case and above 6.7 in the latter case. Buffering is poor at values outside the usual range of buffer mixtures, and in pure HCl and NaOH there is obviously no buffering; however, as pH values were taken immediately before and after the latex was studied, the change in pH, if any, could be noted.

All the isoelectric points given in Table 2 are expected values for protein except the two additional ones for *Cryptostegia* in an Na acetate-acetic acid buffer, one of which is duplicated in unbuffered NaOH. The second should likewise have shown up in unbuffered NaOH, as both the ranges pH 6-7 and 9-10 are regions of protein precipitation maxima, as set forth in the second part of these studies on latices.[8]

TABLE 2. ISOELECTRIC POINTS IN DIFFERENT BUFFERS

Isoelectric Point	Buffer
	Hevea
pH 3.7	KH_2PO_4—NaOH and KHphthalate—HCl
pH 4.6	Na acetate—acetic acid
pH 3.45	Unbuffered HCl and NaOH
	Castilloa
pH 4.1	KH_2PO_4—NaOH and KHphthalate—HCl
pH 4.3	K_2HPO_4—citric acid
pH 3.5	Na acetate—acetic acid
	Cryptostegia
pH 3.95	KH_2PO_4—NaOH and KHphthalate—HCl
pH 3.45	K_2HPO_4—citric acid
pH 3.2	NaH_2PO_4—citric acid
pH 3.65	Na_2HPO_4—citric acid
pH 3.9, pH 6.75, pH 9.0	Na acetate—acetic acid
pH 9.5	Unbuffered NaOH and HCl

The appearance of a second isoelectric point is not startling, but ordinarily, when two isoelectric points are found in a buffered protein, both occur in the same series of readings on any one sample. But the three isoelectric points of *Cryptostegia* latex, when buffered with acetate, occur not in one, but in different samples. In any continuous series of readings on one sample there was but one isoelectric point, obtained again and again in many other samples. Equally often, however, samples of the *Cryptostegia* latex in the same buffer yielded a second and a third isoelectric point, each sample giving but one isoelectric point, and that point might be at pH 3.9, 6.75, or 9.0. (See Figure 2.) The presence of three isoelectric points would appear to be unwarranted. It is possible that as the higher pH values were reached by the addition of NaOH to the acetate, which is then poorly buffered, the protein may have been denatured or otherwise altered. However, and this is an important fact if not an explanation, all three isoelectric points are significant values; they find their counterparts in the behavior of the serum proteins. The first, pH 3.9, is the expected isoelectric point of a protein; the second, pH 6.75, and the third, pH 9.0, are precipitation maxima of the serum proteins.

The two additional isoelectric points above the pH 3.2 to 4.6 range were found only in the case of *Cryptostegia* latex and only in an acetate buffer. However the range pH 6.5 to 7.3 was a region of constant trouble in *Castilloa* latex when in an acetate buffer. Aside from these troublesome regions in the acetate buffer, which in the case of *Cryptostegia* yielded clear-cut isoelectric points, the three species of rubber yielding plants gave very similar mobility curves, with isoelectric points all within pH 3.2 to 4.6, and mostly between pH 3.5 and 3.9. The similarity between the mobility curves and the isoelectric points of *Hevea* and *Cryptostegia* latices, when in a phosphate-phthalate buffer, is shown in Figure 1. The divergent behavior of these latices, when in an acetate buffer, is shown in Figure 2, where *Castilloa* is included.

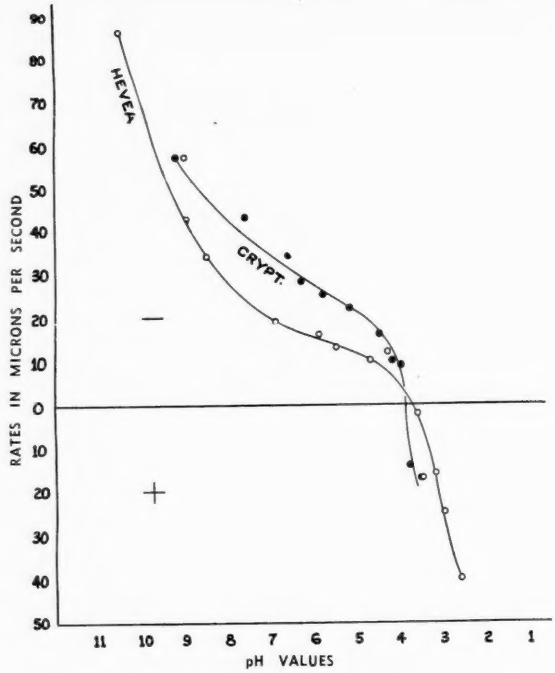


Fig. 1. Migration Curves of Hevea and Cryptostegia Latices in a Phosphate-Phthalate Buffer

of the latter are known to be negative, those of *Cryptostegia* were assumed to be positive, for the following reasons. Both *Cryptostegia* and *Hevea* latices are coagulated by salts and acids, but the concentration of salt or acid required to coagulate *Cryptostegia* latex is very high in comparison to that which will coagulate *Hevea* latex. The dilute concentrations of salt which are sufficient to coagulate *Hevea* latex will stabilize *Cryptostegia* latex.

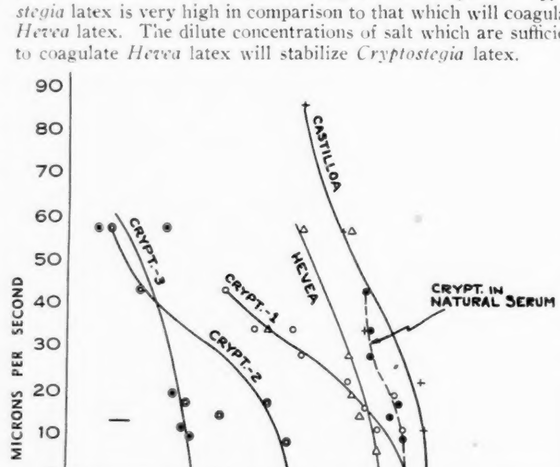


Fig. 2. Migration Curves of Hevea, Castilloa, and Cryptostegia Latices in an Acetate Buffer, with Cryptostegia Latex in Natural Serum

Latex Properties and Electrophoretic Studies of Serum

The feeble charge on *Cryptostegia* particles led to the general assumption that these particles are positively charged. This false assumption rested on indirect experimental evidence, on differences in behavior of *Cryptostegia* and *Hevea* latex. As the particles

[8] The second part will be published in a forthcoming issue of INDIA RUBBER WORLD. EDITOR.

Especially striking is the difference in behavior of the two latices when diluted with water. The latex of *Cryptostegia* coagulates on the addition of five parts of water; whereas *Hevea* latex is readily dispersed in water at that concentration without any coagulating effect. Furthermore, when *Cryptostegia* latex is added to that of *Hevea*, the two coagulate each other, which in terms of good colloidal principles indicates that they are of opposite electrical charge. As *Hevea* is known to be negatively charged, it seemed probable that *Cryptostegia* is positively charged. Finally, the discovery of isoelectric points at pH 6.75 and pH 9.0 in the present work on *Cryptostegia* would have been, were they the only measurements made, conclusive evidence of a positive charge on the particles at the pH value of their natural medium which is about 5 within the plant. Opposing the assumption of a positive charge on *Cryptostegia* latex particles is the fact that when, in biological research, the report comes, as it often has, that certain living cells are positively charged, careful research invariably shows the original report to be untrue. All living cells and

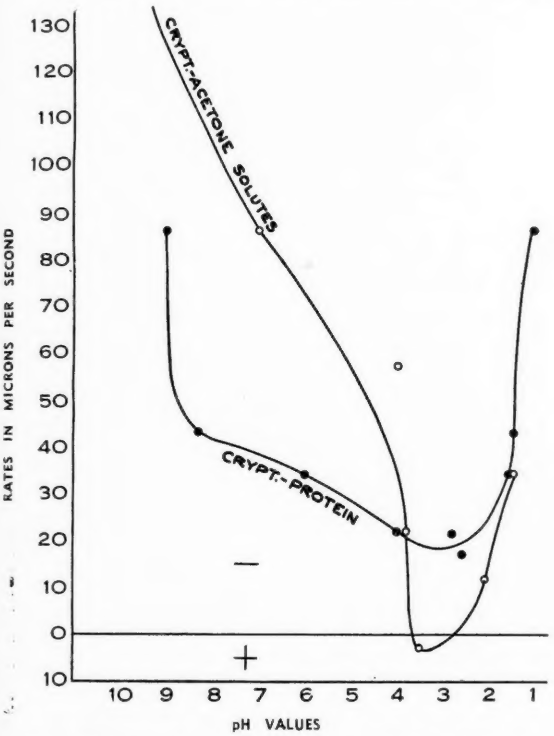


Fig. 3. Migration Curves of Cryptostegia Serum Proteins and Acetone Solutes in Phosphate-Phthalate Buffer

natural emulsions so far investigated are known to be negatively charged when in their natural medium. This point must be true unless the naturally occurring protein has an isoelectric point above the usual pH value of body fluids. It seemed, therefore, unlikely that the latex of *Cryptostegia* should prove an exception to so general a rule. Final evidence could lie only in the direction of electrophoretic migration of the globules when in their natural medium, the latex serum.

The serum of *Cryptostegia* may be obtained by allowing the latex to cream, or more quickly by agitating it with a stirrer. In the former case the latex must stand for several days, and during this creaming period a pronounced increase in acidity will develop. As it is desirable to have a pH value as close to normal as possible, agitating the latex is the preferred method, for then the dispersed phase is quickly coagulated, leaving the dispersion medium quite free of globules and with little change in acidity.

The pH of *Cryptostegia* latex reaches a maximum of 5.4 and probably does not fall below 4.2 within the plant. Out of the plant the latex increases in acidity with time and may fall below pH 4.0. If, therefore, samples of serum at pH 5.4 to pH 4.2 are used, the entire possible natural range is included. The serum of fresh latex not more than 20 minutes out of the plant is usually of pH 5.0 or higher.

Globules of *Cryptostegia* latex suspended in samples of untreated serum, ranging in pH from 4.2 to 5.4, all migrated to the anode; they were, therefore, negatively charged. The lowest pH value reached in serum a day old was 4.0. Migration of the latex particles in this serum was still to the anode; the particles, therefore, were still negatively charged.

By adding acid to fresh samples of *Cryptostegia* latex the pH range may be lowered to 2.9. In such samples of serum a clear-cut isoelectric point at 3.95 was obtained. This is the identical value found in the KHphthalate buffer and very close to the lowest of the three isoelectric points found in the acetate buffer.

As *Cryptostegia* latex particles are negative in their natural medium, the cause of their exceptional behavior in certain other respects must be explained on other grounds.

The foregoing facts leave one in doubt as to the surface composition of the latex particles of *Cryptostegia*. There is first the feeble charge contrasted with the substantial charge on the particles of *Hevea* which suggests that the surface of *Hevea* particles contains proportionately more protein than does the surface of *Cryptostegia* particles; yet the latter, when in acid buffers or acidified serum, show a typical protein isoelectric point at 3.95. Furthermore the pH values of the two additional isoelectric points obtained for *Cryptostegia* latex in an acetate buffer are all coagulation points of the serum proteins.

If the surface of *Cryptostegia* latex particles is predominantly protein, then the electrophoretic behavior of the serum proteins should parallel that of the particles. With a view to ascertaining how far this is true, an electrophoretic study was made of the serum proteins. The proteins were precipitated with sodium hydroxide. The first significant fact was the presence of two precipitation maxima, one near pH 6.8 and one above pH 9.0. The "point" is a band, the proteins frequently coming down at pH 9.0, though sometimes the heaviest precipitate is obtained at a higher value, up to pH 9.8. These are the two regions in which the second and third isoelectric points of *Cryptostegia* latex appear in an acetate buffer. Within the pH range 6.5 to 7.3 small aggregates of coagulated latex frequently appeared in *Cryptostegia*, and, as has been said, the same region was a constant source of trouble in *Castilloa*.

The foregoing observations indicate that the serum proteins are a dominant factor in determining the isoelectric points and zones of instability of *Cryptostegia* latex particles. If, now, the protein precipitates are subjected to electrophoretic study and their mobility curves compared with those of the latex particles, it will be found that there is no similarity between the electrokinetic properties of the serum proteins and the latex globules of *Cryptostegia*. The protein complexes used for electrophoretic study were precipitated at pH 6.5 and pH 9.5. These two serum samples were studied separately, but showed identical behavior.

The protein complex from *Cryptostegia* serum, when in a KHphthalate buffer, approaches an isoelectric point at pH 2.6, but never crosses the line of zero mobility. It, therefore, does not become positively charged at any point between pH 1.1 and 9.5 (Figure 3).

Acetone Solutes

Having found little resemblance between the electrokinetic behavior of *Cryptostegia* latex globules and serum proteins, a study was made of the acetone solutes from the serum, dispersed in potassium phosphate and KHphthalate buffers. A closer analogy exists between the electrophoretic properties of the acetone solutes and the latex globules than between the serum proteins and the latex globules. The mobility curve of the acetone solutes crosses the line at pH 3.5. The solutes, therefore, attain a positive charge, but only within a very short range, and with variable behavior. Many readings taken between pH 3.45 and 3.55 revealed that within this range the acetone solutes may be negatively or positively charged, though predominantly positive. This is the region of the isoelectric points of *Cryptostegia* latex when in a KHphthalate or any one of three types of phosphate buffers, and of one of the three isoelectric points found in an acetate buffer.

Comparison of the mobility curves of *Cryptostegia* latex particles with those of the protein precipitates and the acetone solutes leads to the conclusion that the primary constituent of the surface layer of the latex particles is neither pure protein

(*Continued on page* 593)

High Hardness Water-Resistant Neoprene Stocks

F. W. Gage[1]

WITH the gradual passing of natural rubber from our industrial scene tough, high hardness synthetic elastomeric compositions that are resistant to water at elevated temperatures have come more and more into demand for a large number of mechanical goods applications. Rolls used to remove the excess water from spray-cooled strip metal, plungers and gaskets, hose, motor supports, all must be tough, hard, and water resistant to meet modern-day requirements. Several of the synthetic elastomers have been investigated as possible replacements for nautral rubber in these applications. One that has received considerable attention is neoprene.

However neoprene stocks resulting from compounding with carbon black have several failings and shortcomings. In order to obtain the desired hardness (e.g. 70 to 90 Shore) it is necessary to add a large quantity of pigment, resulting in considerable processing difficulty. Such stocks, when exposed to boiling water, swell and soften rapidly, thus becoming useless in a relatively short time. Then, too, carbon black stocks are black, not permitting the range of colored compositions that a compounder often desires.

Prompted by these facts, an investigation has been undertaken in this laboratory to evaluate some of the compounding factors which affect the characteristics of neoprene stocks for these applications. Earlier work[2] had shown that moisture plays an important role in GR-S tread compounding, having a marked effect on the rate of cure and to a limited extent on the hardness of the stock. This effect was even more pronounced in GR-S stocks containing hydrated calcium silicate[3, 4]. It was also known that neoprene stocks containing such a reenforcing agent approached the hardness and toughness demanded in such applications, even with moderate loadings of pigment, and that such stocks, upon exposure to water, increased in hardness[4, 5]. Accordingly research was initiated to investigate the effect of water added to such stocks during mixing. In the course of this work it was found that better results could be achieved through the addition of polar materials less volatile than water to such compositions.

Experimental Procedure

In carrying out this development the following neoprene-base recipe was selected.

Neoprene GN-A (GR-M)	100.0
Extra-light calcined magnesia	4.0
Zinc oxide	5.0
Sodium acetate	1.0
Permalux	1.0
Phenyl-beta-naphthylamine	3.0
Light processing oil	10.0
Stearic acid	3.0
Petrolatum	1.0

Each stock was mixed according to conventional practice. Any additive to be incorporated was added simultaneously with the pigment. Some of the stocks were conditioned in a desiccator over water at room temperature for eight days. The amount of water absorbed was determined by following the change in weight.

All stocks were cured for 120 minutes at 307° F. Curing was done after the stocks had rested for about 16 to 24 hours, with the exception of the stocks conditioned over water. These slabs were cured soon after their removal from the desiccator.

To determine the effect of boiling water on the stocks four-inch by two-inch strips were cut from the stress-strain sheets, along with small strips, ca. ½-inch by one inch. The hardness of the large strips was determined with a Shore Type A durometer, while the weight and specific gravity of the small strips were measured. Both the large and small strips were immersed in boiling water. These strips were removed at regular intervals, and the hardness, weight, and specific gravity determined. After apparent equilibrium had been attained (in regard to hardness and volume change), the strips were exposed to the atmosphere (ca. 25° C.), and the changes in hardness and volume followed.

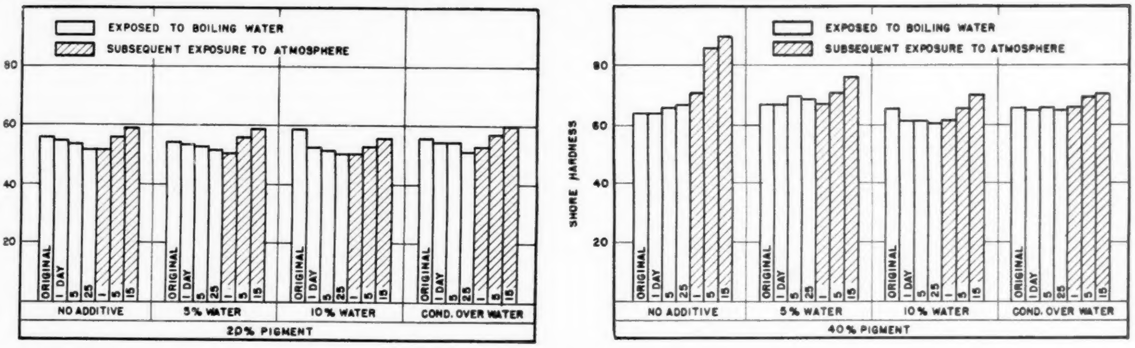
Results and Discussion

Four different loadings of hydrated calcium silicate were used in this investigation. The hardness values obtained on exposure of the compounds to boiling water and then to the atmosphere are shown in Table 1 and Figures 1-4. These figures demonstrate several interesting facts. In the lower loadings (20 and 40% pigment) the addition of water, either directly or by conditioning the uncured stock, has very little influence on the hardness; while in the higher loadings (60 and 80% pigment) it has a pronounced effect, producing a 10 to 20% increase. On exposure to boiling water the hardness of the 20% loaded stock decreases, while that of the 40% loaded stock remains constant, and the hardness of the more highly loaded stocks increases appreciably. This increase is most pronounced with the stock containing the least amount of added water.

[1] Pittsburgh Plate Glass Co., Barberton, O.
[2] H. A. Braendle and W. B. Wiegand, *Ind. Eng. Chem.*, 36, 724 (1944). F. E. Rupert and F. W. Gage, *Ibid.*, 37, 378 (1945).
[3] Silene EF.
[4] Pittsburgh Plate Glass Co., unpublished data.
[5] E. I. du Pont de Nemours & Co., Inc., unpublished data.

TABLE 1. EFFECT OF BOILING WATER AND SUBSEQUENT EXPOSURE TO THE ATMOSPHERE ON THE HARDNESS OF NEOPRENE GN-A STOCKS CONTAINING HYDRATED CALCIUM SILICATE.

Compound	After Exposure to Boiling Water for						After Subsequent Exposure to Atmosphere for			
	Original	1 Day	5 Days	10 Days	15 Days	25 Days	1 Day	5 Days	10 Days	15 Days
20% pigment										
No additive	55	54	53	52	51	51	51	55	58	59
5% water	54	53	52	51	51	51	50	55	58	59
10% water	59	52	51	50	50	50	50	52	55	55
Conditioned over H20 to 1.4% moisture	55	55	54	53	51	51	53	57	59	60
40% pigment										
No additive	63	63	65	65	65	66	70	85	87	89
5% water	66	66	69	69	68	68	66	70	73	75
10% water	65	61	61	61	61	60	61	65	68	69
Conditioned over H20 to 1.8% moisture	65	64	65	65	65	64	65	69	69	70
60% Pigment										
No additive	66	70	75	81	82	84	86	94	95	96
5% water	70	71	76	80	80	82	84	94	95	96
10% water	71	68	69	69	70	70	71	78	82	88
Conditioned over H20 to 2.0% moisture	73	71	73	73	77	79	79	86	90	92
1% glycol	69	73	79	83	83	....	....	....	91	94
3% glycol	80	80	80	85	85	....	....	....	94	94
80% pigment										
No additive	76	80	85	90	90	92	94	98	99	99
5% water	80	80	89	94	95	95	95	98	99	99
10% water	84	78	80	85	88	90	91	95	97	98
Conditioned over H20 to 1.7% moisture	85	84	87	87	93	93	95	95	98	99



Figs. 1-2. Effect of Boiling Water and Subsequent Exposure to the Atmosphere on the Hardness of Neoprene GN-A Stocks Containing Hydrated Calcium Silicate

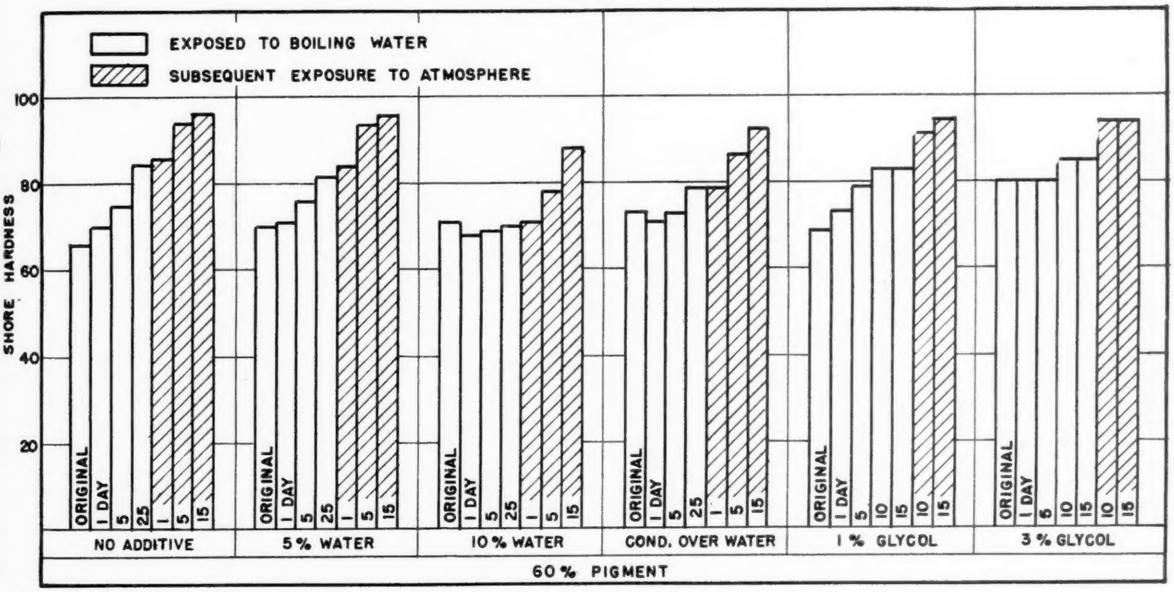


Fig. 3. Effect of Boiling Water and Subsequent Exposure to the Atmosphere on the Hardness of Neoprene GN-A Stocks Containing Hydrated Calcium Silicate

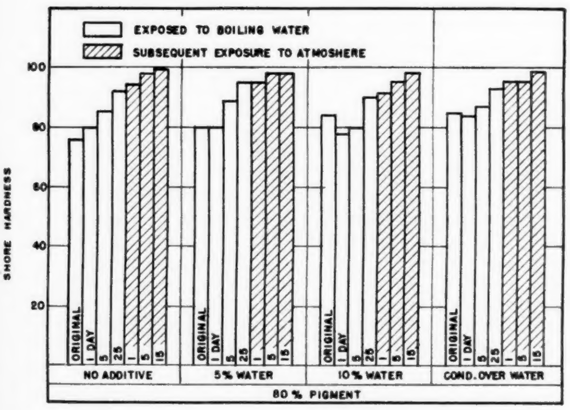


Fig. 4. Effect of Boiling Water and Subsequent Exposure to the Atmosphere on the Hardness of Neoprene GN-A Stocks Containing Hydrated Calcium Silicate

In Table 2 and Figures 5-8 are shown the volume changes accompanying exposure of these stocks to boiling water and to the atmosphere. These figures clearly show that the swelling is inversely proportional to the pigment loading.

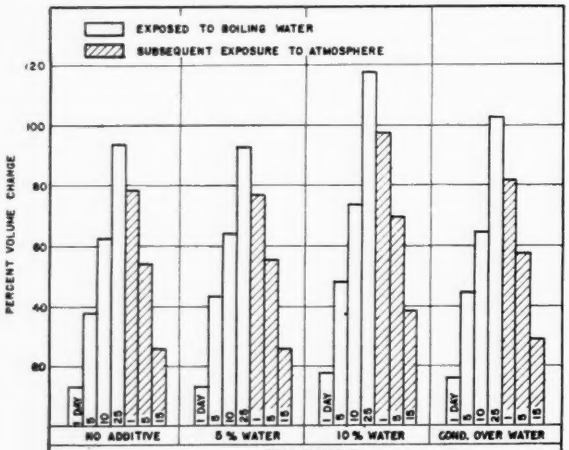
The one striking fact brought out by these data is that the addition of water to the compound before cure stabilizes the hardness of the stock, but accelerates the swelling. Attention was therefore directed to other polar compounds, and ethylene glycol in particular. Besides being relatively non-volatile as compared to water, and since its addition to the neoprene compound could be more readily controlled, it was thought possible that ethylene glycol might stabilize the hardness of the compound without accelerating the swelling. That this is the case is borne out by the data presented in Figures 3 and 7. The addition of only 1% ethylene glycol to the compound has about the same effect on the hardness as the addition of 5% water, although the swelling in boiling water of the compound to which the ethylene glycol was added is somewhat less than that of the compound to which the water was added. However the addition of 3% ethylene glycol has a very different effect. The original hardness of the stock containing 3% ethylene glycol is appreciably greater than that of the stock containing 5% water. At the same time the addition of 3% ethylene glycol has a stabilizing effect on the hardness of the compound on its continued exposure to boiling water even more pronounced than that of the addition of water. At the same time the addition of 3% ethylene glycol reduces appreciably the swelling of the compound under like conditions as compared to that of compounds to which water has been added. Even the

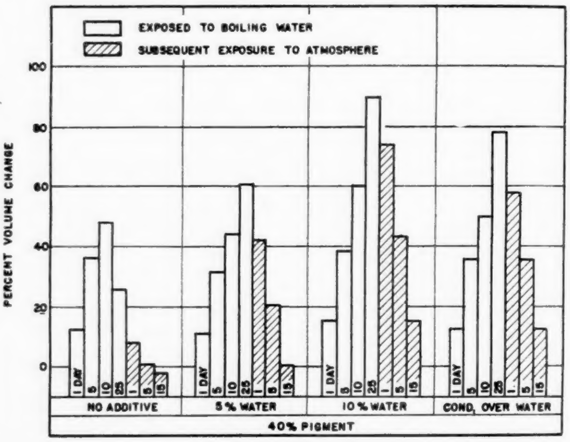
Table 2. Effect of Boiling Water and Subsequent Exposure to the Atmosphere on the Volume Change of Neoprene GN-A Stocks Containing Hydrated Calcium Silicate

Compound	After Exposure to Boiling Water for					After Subsequent Exposure to Atmosphere for			
	1 Day	5 Days	10 Days	20 Days	25 Days	1 Day	5 Days	10 Days	15 Days
20% pigment									
No additive	13.0*	38.2	62.1	91.5	94.5	78.5	53.9	37.8	25.9
5% water	12.9	43.2	64.1	89.8	93.5	77.3	55.4	37.0	25.9
10% water	17.8	47.8	74.1	113.0	118.0	98.0	69.8	50.1	39.0
Conditioned over H20 to 1.4% moisture	15.9	44.8	64.5	94.7	102.5	81.6	57.8	38.0	29.3
40% pigment									
No additive	12.6	36.2	48.1	31.8	26.1	8.1	1.0	—1.2	—1.7
5% water	11.1	31.6	44.1	60.7	60.7	42.1	20.8	6.5	0.5
10% water	15.6	39.0	60.2	89.2	90.3	74.4	43.7	25.1	15.1
Conditioned over H20 to 1.8% moisture	12.3	35.9	49.8	74.3	78.1	57.9	35.4	19.6	12.2
60% Pigment									
No additive	9.1	23.9	20.6	14.1	13.1	4.0	—0.3	—1.7	—2.0
5% water	8.0	32.1	29.0	20.0	18.2	7.6	2.4	1.0	1.0
10% water	17.0	41.5	50.8	36.2	31.0	18.0	4.2	—0.9	—1.2
Conditioned over H20 to 2.0% moisture	12.9	27.0	25.1	18.9	16.8	7.1	1.8	—0.6	—1.4
1% glycol	21.8†	23.0	19.8	....	....	....	....	....	0.6
3% glycol	25.3†	17.0	14.3	....	....	....	....	....	—1.4
80% pigment									
No additive	9.0	18.9	17.7	13.0	13.0	6.9	2.0	0.8	0.0
5% water	7.9	15.2	12.6	9.4	9.5	4.2	0.0	—1.2	—1.5
10% water	11.1	21.1	16.1	13.2	12.5	6.0	0.1	—1.0	—2.0
Conditioned over H20 to 1.7% moisture	9.0	16.4	15.1	13.9	12.1	7.1	1.8	1.4	—0.5

* % volume change.

† After three days' exposure.





Figs. 5-6. Effect of Boiling Water and Subsequent Exposure to the Atmosphere on the Volume Change of Neoprene GN-A Stocks Containing Hydrated Calcium Silicate

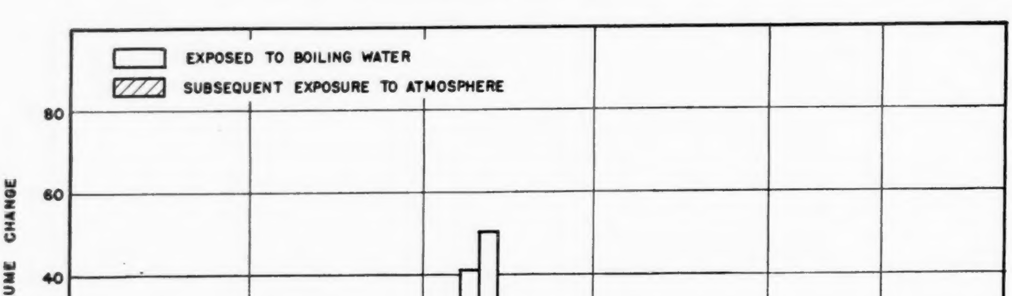


Fig. 7. Effect of Boiling Water and Subsequent Exposure to the Atmosphere on the Volume Change of Neoprene GN-A Stocks Containing Hydrated Calcium Silicate

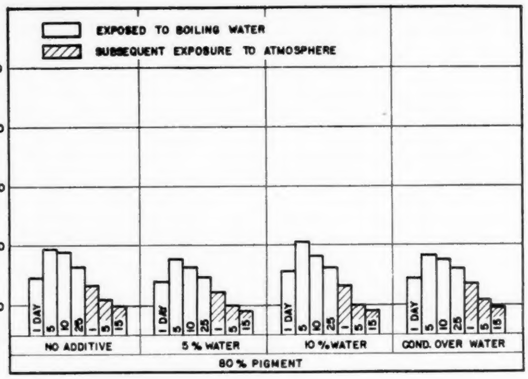


Fig. 8 Effect of Boiling Water and Subsequent Exposure to the Atmosphere on the Volume Change of Neoprene GN-A Stocks Containing Hydrated Calcium Silicate

degree of swelling of the compound containing no additive is somewhat greater than that to which the ethylene glycol has been added.

The addition of either water or ethylene glycol increases somewhat the modulus of the neoprene compounds, but has little effect on the tensile strength or tear resistance (Table 3).

Table 3. Stress-Strain Data of Four Typical Compounds*

Compound	Modulus 100%	300%	500%	Tensile†	Elongation %	Shore Hardness	Tear‡
60% pigment	227	652	1134	1617	635	66	24
60% pigment 5% water	340	766	1191	1418	580	70	23
60% pigment 1% glycol	284	766	1276	1602	605	69	27
60% pigment 3% glycol	383	865	1333	1588	580	80	28

* Cured 120 minutes @ 307° F.
† Pounds per square inch.
‡ Pounds per 0.1 = inch thickness.

Summary and Conclusions

To summarize, it has been demonstrated that increasing the loading of hydrated calcium silicate in a neoprene stock decreases the tendency for such a stock to swell in boiling water. Stocks containing 60 to 80% hydrated calcium silicate possess excellent water resistance.

These more highly loaded stocks swell, when first exposed to boiling water, and then on continued exposure tend to reduce to their original volume. Immersing such stocks into boiling water increases their hardness appreciably. The addition of water before cure, while increasing somewhat the original hardness, does not reduce appreciably the increase in hardness accompanying continued exposure to boiling water, and increases the tendency of the compound to swell. However, if ethylene glycol is added, the original hardness is markedly raised, and continued exposure to boiling water has no significant effect on the hardness, nor does this exposure have any more effect on the swelling of this compound than it does on one which contains no additive. This difference in the effectiveness of water and ethylene glycol may be due in part to the higher volatility of the former. Less than 2% water was picked up during the eight-day conditioning period; yet this amount of water was almost as effective as 10% water added on the mill. Subsequent exposure of these stocks to the atmosphere results in an increase in hardness; the increase depends on the loading.

By employing moderate loadings of hydrated calcium silicate and ethylene glycol as an additive, a tough, hard, water-resistant neoprene stock can be produced. By judicious balancing of the pigment and ethylene glycol a fairly wide range of hardness can be covered.

The author wishes to thank H. G. Antles, C. T. Beach, and R. J. Wise for their assistance in preparing and testing the neoprene stocks.

Studies of Hevea

(Continued from page 589)

nor primarily a substance soluble in acetone.

Discussion

The interpretation of the foregoing data will in large measure depend on one's point of view. In industry the conviction prevails that the surface of latex particles is protein. If one wishes to retain this point of view, it may be argued that the difference in behavior of *Cryptostegia* and *Hevea* latex is due to different proteins with different groups exposed. This may be true, but the electrophoretic behavior of the serum proteins gives little support to a predominantly protein covering, and the feeble charge on *Cryptostegia* latex particles is evidence of a predominantly non-protein, certainly non-ionizable component of the surface material. Unfortunately the limitations of the desert laboratory in Haiti did not permit a ninhydrin test or a protein assay of any kind. Taking the evidence as it is, and it is clear on several points, the indications are that the particle surface contains an undetermined non-ionizable substance. The nature of this substance which in the case of *Cryptostegia* possibly predominates is suggested by the chemical composition of natural rubber.

Among the substances which have been named as constituents of the surface of latex particles, proteins, resins, sterols, etc., little mention seems to have been made of the likelihood of the surface being composed in part of the very hydrocarbon which is the basic material of rubber, the hydrocarbon which is the core and the bulk of the latex globule. That hydrocarbon plays a role in the electrophoretic migration of latex particles is indicated by a consideration of the mechanism of latex coagulation. This is the subject of a subsequent publication.[8]

Summary and Conclusions

(1) The ionic species of the buffer used in electrophoretic studies determines in part the isoelectric point and the shape of the mobility curve.

(2) The surface composition of the particles of *Cryptostegia*, *Hevea*, and *Castilloa* latices differs; the difference between *Cryptostegia* and *Hevea* is particularly great.

(3) Evidence of a protein character of the surface of *Cryptostegia*, *Hevea*, and *Castilloa* latex particles lies in the isoelectric points of all three species when their latices are dispersed in any one of five buffer types, in unbuffered acid and alkali, and in the natural serum. These isoelectric points are all typical protein coagulation regions.

(4) The charge on *Cryptostegia* latex particles is negative; migration is to the anode at all natural pH values when the particles are in their natural serum.

(5) Though isoelectric points indicate protein coverings on the latex particles, the feeble charge on *Cryptostegia* particles compared with the greater charge on *Hevea* particles suggests an essentially protein constitution of the *Hevea* particle surface, and a primarily non-protein composition of the *Cryptostegia* particle surface.

(6) The failure of the migration curve of the *Cryptostegia* serum proteins to reveal an isoelectric point, and the general dissimilarity between the protein curve and that of the latex particles, lend further support to the assumption of an essentially non-protein character of the *Cryptostegia* particle surface.

(7) The non-protein and apparently non-ionizable substance which forms a major portion of the adsorbed surface layer of *Cryptostegia* latex particles is believed to be the hydrocarbon which constitutes the core and the bulk of the latex particle; in short, there is molecular continuity between the inner hydrocarbon and the outer layer of the latex globules.

Ten years ago unfavorable market conditions forced the Australian Commonwealth Carbide Co., Electrona, Tasmania, to suspend the manufacture of carbon black. Under present altered conditions, however, the company is reported to be preparing to resume production and to have installed equipment with an annual output capacity of 150 tons.

EDITORIALS

A New Department on Plastics

DURING the war years the use of synthetic resins and plastics in the rubber industry has increased tremendously for several reasons. Limitations on the use of natural rubber necessitated finding an immediate replacement for some products until synthetic rubber became available in quantity, and the use of plastic compounds in coating and extruding operations grew almost overnight to many times their prewar volume. Various rubber companies entered into new fields, such as plastic laminating, in order to use most effectively their available production capacity for the war effort. As a result of the experience that has been gained with these new materials and new processes, the use of synthetic resins and plastics by the rubber industry in the postwar period seems likely to be continued at a high level.

INDIA RUBBER WORLD in this issue is therefore instituting a new department entitled, "Plastics Technology," in order to provide information from resin manufacturers, processors, and equipment manufacturers, as well as from technical and trade associations and societies, for use by its readers who may be engaged in or who are contemplating operations involving plastic materials. At start the information will probably be concerned mostly with the elastomeric type of plastics, but this policy does not mean that the field of rigid plastics, in which some rubber companies have a considerable interest, will be neglected.

One of the most important things we would like to point out in connection with this new effort of INDIA RUBBER WORLD, which will mean the addition of several editorial pages, is that we do not intend to cover the entire field of plastics, but will try only to provide short articles and reviews on items which we feel are of greatest interest to the rubber industry. In spite of the numerous publications devoted entirely to the subject of plastics, we believe that there is a place for and a need of some specific information in a publication whose main purpose has been to provide the best possible service to the rubber industry at all times.

Collyer's Remarkable Job

THE accomplishment of John L. Collyer as Special Director of Rubber Programs for the War Production Board in bringing about the necessary balance between supply and demand for tires and other rubber products and arranging for an adequate supply of the component materials required for the manufacture of these products, all in the short space of the three difficult months, from April to July should be recorded as one of the outstanding achievements of a rubber industry executive to the war effort. Mr. Collyer's success in doing his job in Washington so quickly and so well is all the more remarkable and at the same time understandable since it was the first time during the war period that a head of one of the larger companies in the industry was placed in charge of the government's rubber programs, and it was also the first time that the problems involved were concerned mostly with the actual production of rubber products and not the productions of rubber itself.

Mr. Collyer's approach to the problems of the rubber programs, when he was called to Washington on March 21, was an example of how sound common sense and aggressive administrative follow-through could bring order out of confusion and deliver the goods on time even under constantly changing conditions. This approach is best explained in his "Report of the Special Director of Rubber Programs to the War Production Board," issued on July 18, in which he states:

"The frequent and drastic changes in military and essential civilian rubber products requirements, which the rubber industry has experienced throughout the war period, makes the approach to our complex rubber problems like the attack on a *moving target.* In charting a course to hit that target it has been and will continue to be necessary to balance changing production facilities, manpower availability and component production with changing military and essential civilian requirements."

As is now well known, Mr. Collyer immediately had new studies made of military and civilian requirements for tires and other rubber products, of requirements for the components used in manufacturing those products, of production capacities, present and future, for the manufacture of components and finished rubber products, and of manpower requirements and availability for the production of both components and finished products.

"As a result of these studies, certain steps have been taken and certain steps are recommended to balance the rubber programs of the United States for greater speed in attaining final victory," Mr. Collyer reports.

In spite of the setbacks suffered as a result of the recent wave of strikes, the facts given in the Collyer Report and the generally high level of production of the industry amply confirm the more optimistic outlook that is now possible.

Mr. Collyer's recommendation that a Director of Rubber Programs be a continuing officer on the staff of the chairman of the War Production Board "in order to keep in balance the complex programs for producing military and essential civilian tires and other rubber products, and at the same time, providing our Armed Forces with the equipment required to prosecute offensive warfare against Japan" is another noteworthy example of proper follow-through. The appointment of Robert S. Wilson, vice president of the Goodyear Tire & Rubber Co. to this post should insure that these rubber programs will be kept "in balance."

Plastics Technology

Rubber and Plastics—United through Research[1]

A FULL realization of the similarity of the purposes, materials, and techniques of the plastics industry to those of the rubber industry is of the utmost importance to postwar planning. It will affect not only the future value of some of our largest war plants, especially the synthetic rubber plants, but also the speed and efficiency with which the expected tremendous expansion of the plastics industry is to be accomplished.

Similarities between Rubber and Plastics

Rubber in its unvulcanized form is itself a thermoplastic, and many of the processes and much of the machinery and equipment of the rubber factory can easily be adapted to plastics. For these reasons there are many who hold that rubber manufacture and plastics manufacture should be classified together as a single industry, in which, to be sure, rubber was the first product to be developed on a large scale and is still by far the largest item.

The problem of preparing the raw materials for processing and manufacture is essentially the same for plastics as for synthetic rubber, involving polymerization, copolymerization, coagulation, purification, and stabilization. The results of synthetic rubber researches on catalysts, heat transfer during polymerization, degrees of polymerization, effect of traces of impurities, and many problems of engineering (such as construction materials of reactors, types of stirrers, and temperature control) can all be used to advantage by research men in the plastics industry, and conversely.

Equally similar are the problems connected with the processing of the raw materials and the manufacture of finished articles. Many plastics, like rubber (both natural and synthetic), may be milled on hot roll mills, calendered to various gages, extruded through dies, lathe-cut from sheets, or formed into different shaped articles in various types of molds. As is to be expected, special modifications and adaptations have to be made for various types of plastics, just as they do for various types of rubbers. For example, in the "skim-coating" of fabrics by means of a calender most plastics require a higher temperature than rubber, as well as larger crowns for the upper roll. But the basic machinery and apparatus are the same for both rubber and plastics: namely, mixers, crushers and grinders, roll mills, calenders, extrusion machines, molds, cutting and finishing machines.

The compounding of various pigments with the raw material to produce certain definite effects such as stronger tensile, increased hardness, greater tear resistance, or better electrical properties, is just as important with plastics as with rubber and presents altogether similar problems, such as the study of the optimum ratio of pigment to base, or methods of obtaining an even dispersion of the pigment in the base. Further, many plastics, like most rubbers, can be made into cements with special solvents and used for adhering various substances to each other or for dipping fabrics and papers.

[1] As told to D. M. Beach, technical staff, research division, by H. E. Fritz, director of research, B. F. Goodrich Co., Akron, O.

Frank Schoenfeld (Left), Technical Director, B. F. Goodrich Chemical Co., and Dr. Fritz Observe the Non-Flammability Characteristics of Koroseal Sponge

Even the process of vulcanization which is employed for natural rubber and some synthetic rubbers, and which is adduced by some to differentiate the rubber industry from the plastics industry, has its counterpart in the curing of thermosetting resins. There are similar questions to be answered in both types of cure, such as the optimum balance between time and temperature of the cure, and the effects of undercuring and overcuring on different types of material.

Finally, the long experience of the rubber industry in evolving control tests to determine the physical and other characteristics of different compounds and manufactured articles constitutes a firm foundation for the testing of plastics. The qualities to be tested are almost identical for both rubber and plastics, including stress-strain characteristics, aging qualities, hysteresis, electrical properties, power of adhesion, resistance to heat and cold, cracking, abrasion tear, oil and chemicals. Many of the same instruments and much of the same technique can be employed and where this utilization is found to be impossible, the experience of the rubber industry will often point the way to new methods and new apparatus.

Geon Plastics, a Result of Research on Rubber

It is only natural, therefore, that the big rubber companies have been giving increased attention to plastics research and development. Among the first plastics to be developed by the rubber companies were The B. F. Goodrich Co.'s polyvinyl chloride plastics, the products of which have become widely known under the trade name of Koroseal. The plastics themselves are now called Geon plastics, to distinguish them from the Koroseal products that are made from them. They were discovered in 1927 by W. L. Semon, as a by-product of his researches on new materials for bonding rubber to metal. While the products did not possess the adhesive properties for which Dr. Semon was looking, they had a combination of other qualities that made them look especially promising as commercial articles, among which were elasticity, thermoplasticity, resistance to chemicals.

The commercial development of the Geon plastics depended principally on the cost of their production and the market demand for the products. The problem of cost was solved partly by the cheapness and abundance of the raw materials required (coke, limestone, and common salt), partly by the background of technical experience already gained in rubber manufacture and research, and partly (perhaps chiefly) by the use of the same machinery and equipment which had been used for rubber. The problem of a market was solved by a surprisingly large demand for Koroseal products, due chiefly to three qualities in which they are superior to rubber—their non-flammability, their resistance to aging, and their insolubility in oils and most chemicals. The many civilian uses to which Geon plastics have been put (raincoats, shoes, garden hose, molded articles of many types) must be held in abeyance for the present, as the Navy now takes practically all the Geon that is manufactured, mainly for non-flammable cable covering, but also for other important defense purposes.

Future Development Possibilities

Though Geon plastics may thus be cited as an example of plastics which owe their discovery and development to the rubber industry, they have repaid that debt in at least two ways. First, they have served as a replacement for rubber in many articles and have thus liberated large qauntities of rubber for other purposes for which it was crucially needed. If the tonnage of rubber which has been replaced by Geon and other plastics during the present war could be published, the figure would be astounding to most laymen. Second, the technical knowledge gained from years of research and development in these plastics has been of the utmost value in the development of the mighty synthetic rubber industry, without which Germany and Japan could not have been defeated. In brief the development of plastics and that of rubber (especially synthetic rubber) have been mutually beneficial, and the results of one have been advantageously applied to the other. It has even been found that certain plastics can be copolymerized with certain synthetic rubbers, to form new and useful products. The study of the mixture and copolymerization of plastics with rubbers is still in its infancy, but it is bristling with possibilities. Already mixtures of plastics and rubbers combining varying degrees of sunlight, ozone, and solvent resistance with oil resistance and thermosetting properties have been found to be particularly suited for certain applications.

In the postwar era it is probable that the pendulum will swing again, away from synthetic rubbers toward synthetic resins. In that case the machinery and technique and experience of the concentrated synthetic rubber war effort will be passed on to the manufacture of plastics. It will be the task of research to build upon the foundations already laid by both the rubber industry and the plastics industry, to discover principles, to seek new materials, higher standards of quality, improvements in colors and styles, and new techniques. Whether or not the expected return of natural rubber to the market will induce the conversion of some of our synthetic rubber plants to plastics manufacture, the rubber companies will be in a peculiarly favorable position to adapt a large part of their equipment, personnel, and accumulated scientific and practical experience to the new demands in the field of plastics.

Contact Laminating[1]

THE preparation of no pressure or "contact" flat sheet laminates using the various thermosetting resins such as the Laminacs, is an extremely simple operation. Fabric may be impregnated by feeding the cloth through a dip tank of catalyzed resin and then usually passing through light squeeze rolls to remove the excess resin. Multiple wet plies are laid up on a cellophane covered sheet-metal plate to the desired thickness. Such a parting agent as cellophane is placed over the wet assembly, and air bubbles are removed by wiping or rolling. A second metal plate to give uniform heat transfer on both surfaces completes the assembly.

The Laminacs are thermosetting resins varying in the uncured state from liquids of increasing viscosities to a solid of the consistency of lard or tallow. These goods offer a variety of electrical and mechanical properties, when cured, and should be selected in accordance with the particular properties desired in the finished laminate. The resins are 100% reactive, and the use of a small quantity of peroxide catalyst activates their rapid conversion at elevated temperatures to tough solid plastics. They are thus converted to solids of exceptional dimensional stability without the formation of by-products.

It is also perfectly satisfactory to apply the Laminacs to the reenforcing material by brushing. In certain formulations, excess exposure to the air prevents proper cure, and, thus, with these resins, spraying on the surface is not feasible. Because of this latter characteristic, the wet assembly should be prepared quickly as prolonged exposure prevents the laminated part from developing proper stiffness and hardness in the curing process. However there are newer types of formulations which have very little sensitivity to air and one resin, recently introduced, is hard, tough, and completely unaffected by exposure to air during lay-up and cure. These new formulations, all possessing different combinations of properties, were developed to overcome certain disadvantages inherent to earlier resins. When such properties as electrical low loss, heat resistance, dimensional stability, lack of air sensitivity, and hardness are desired in various combinations, the selection of the proper type of material from the complete line of Laminac resins is easily accomplished.

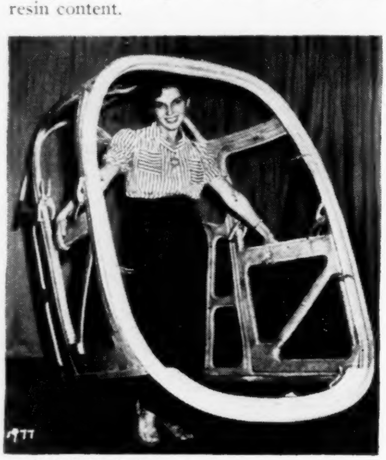
Fabrication, Molds, Etc.

A laminate built up on a male mandrel, such as a tube, must be covered on both sides with cellophane or an impervious film of Silicone stop cock grease, PVA, or the like, before placing it in the oven for cure. It is necessary to apply such a film on a copper or bronze mold before the impregnated material is placed into it to prevent the inhibiting action of copper. A separator also prevents adhesion to wooden molds. As rubber is attacked by uncured Laminac and as the effect of sulphur and antioxidants is unfavorable, cellophane or some other parting agent should be placed against a rubber bag when this technique of curing is employed. Impervious films of this type strip easily from the cured part and transmit their smooth surfaces to the finished product.

While cured flat sheets may be readily formed into complex shapes by heating at the point of desired curvature before applying pressure, one of the outstanding advantages of the Laminacs is the relative ease of building up large complex laminated shapes on inexpensive molds or mandrels. Some parts are readily fabricated by the use of a sheet metal female mold, as a rubber bag inflated to 15 pounds provides sufficient pressure to produce an excellent structure. In many cases tension or stretch pressure on a male mandrel is a more logical method.

Resin Content

With a given filler, the mechanical and electrical properties can be varied somewhat, depending upon the percentage and the type of resin used. Naturally a contact pressure laminate contains a high ratio of Laminac to fabric; as much as 60% in the case of cotton duck. Some improvement in mechanical properties is generally observed when pressure up to 15 psi is used. The use of various pressures as high as 100 psi is a simple means of regulating resin content.



United States Rubber Co.

A glass-cloth Laminac bonded laminate was chosen for the cabin structure of the R-6 helicopter because of its light weight, great tensile strength, rigidity, and ability to withstand strains and excessive vibration. The structure here illustrated was produced by the United States Rubber Co. It is anticipated that in the postwar period contact laminates will find wide usage for luggage, decorative panels, semi-structural parts, refrigerator panels, and many simliar applications

Curing Procedures

The cure is effected by transferring the laminate to an oven heated to approximately 240° F. Thin laminates are being cured commercially in less than 15 minutes. It is relatively simple to establish the proper cure cycle as the reaction is not critical within fairly broad conditions of temperature change.

Heat transfer is an important consideration. A much shorter cure time is required with fabricated sheet-metal than with wooden, concrete, or plaster molds. The efficiency of the oven or autoclave is an important factor and proper circulation of air in the oven is essential in order to provide uniform heating of the molded laminates. Steam, hot water, or electrically heated sheet-metal male and female dies are ideal, but not necessary.

When maximum rigidity is desired, the need of short assembly time and high resin content is generally indicated. There is also evidence that a 20-minute heat cycle at 240° F., followed by 40 minutes at 300° F. or higher, results in greater stiffness than one hour at 240° F.

Steam-heated molds or infrared lamps are equally as suitable as hot air ovens for curing the Laminacs. By making adjustments for the best means of curing a particular part, substantial reductions in cure time have been worked out in production. A convenient means of measuring degree of cure is the determination of hardness with a Barcol impressor, preferably on the unfilled flash.

Shrinkage of Laminac during cure causes an internal pressure which tightens the plies, thus establishing more intimate contact. This effect is observed particularly when a male mandrel is used. Once cured, however, this reenforced plastic has exceptional dimensional stability over a wide range of atmospheric conditions.

One of the most valuable properties, from the fabricator's point of view, is the ability of the Laminacs to act as their own adhesive. A complex laminated part may be cured in sections which can then be bonded together by using catalyzed liquid resin as the glue. Sanding of contact points, application of uncured Laminac to both surfaces, and a short cure between "C" clamps gives a joint comparable in strength to the laminate itself.

Machining and Finishing

Laminates made from these resins may be finished and machined on standard machine shop equipment. The materials bonded by contact resins used vary from paper to very hard and abrasive materials, such as glass cloth, where it is necessary to use carboloy or diamond tipped cutting tools. Milling, sawing, drilling, sanding, and other machining are easily accomplished by the use of the proper tools, and the only essential difference is that an air blast with a vacuum hose to pick up chips is frequently used as a cooling system. Oil is not used as a lubricant although water has served well for this purpose.

[1] This discussion was prepared from technical bulletins of the American Cyanamid Co., Plastics Division, New York, N. Y.

Calendering and Extrusion of Plastics[1]

WITH any thermoplastic material, whether it be molded, extruded, or calendered, the ultimate properties obtained and success of the operation depend almost entirely on getting into the material sufficient heat to flux it thoroughly throughout its mass without at the same time bringing any portion of it up to a temperature at which thermal decomposition occurs. Frequently it is possible to process compounds at temperatures far below the optimum and secure finished products which in appearance are as good as those processed at a higher temperature. Properties, however, suffer markedly, and it behooves the processor to establish quality tests in order to safeguard against the natural tendency of machine operators to operate in the easiest possible way. The processing temperature must be high enough completely to relieve all strains in the material; otherwise warpage in rigid and semi-rigid materials or excessive thermal shrinkage in elastomeric materials will result.

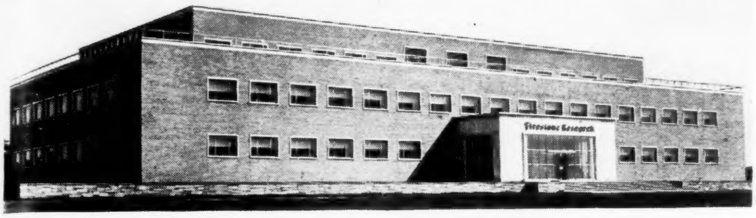
For elastomeric materials, such as poly-

(*Continued on page* 599)

[1] Reprinted from "Technical Data on Plastics," Plastics Materials Manufacturers' Association, Washington, D. C., Apr., 1945.

Scientific and Technical Activities

The New Firestone Research Laboratory



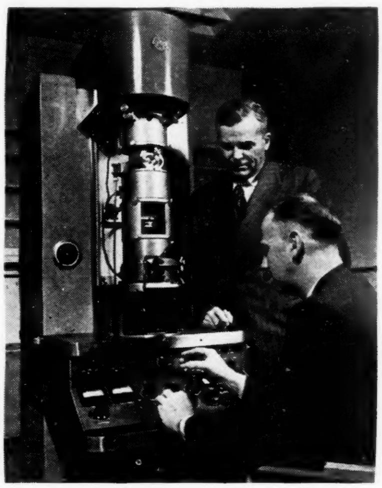
The New Firestone Research Laboratory

LOCATED on a 20-acre plot high on a hill overlooking the Firestone Tire & Rubber Co.'s plants in Akron, O., is a new three-story buff brick, air-conditioned building equipped with the latest scientific instruments and apparatus for research on rubber plastics, metals, and textiles. Designed and constructed under the direction of John W. Thomas, chairman of the board of the Firestone company, this $2,000,000 research laboratory should be one of the places where the major chapters in the future progress of the rubber industry will be written, according to Mr. Thomas.

The laboratory has prefabricated steel inner walls and partitions which can be moved to rearrange completely the interior of the building. Scientists work in two-, four-, and six-man laboratories, but the larger laboratories can be revised if desired. A six-man laboratory, for example, could be divided into one four-man and one two-man laboratories or into three two-man laboratories. The fixtures in the laboratories also can be rearranged to meet the varying needs of the researchers. Service units provide facilities for hot, cold, and distilled water, for steam, gas vacuum, compressed air and a wide range of alternating and direct electrical currents.

Constant temperature and humidity control have been arranged for a room devoted to infra-red spectroscopy, an electrical measurements room, and a physical testing room. Beauty and utility are combined in a large library. On the roof is an aging laboratory used to check the effect of the weather on materials and products.

An electron microscope that magnifies up to 100,000 times is one of the important large instruments available. In the accompanying illustration, J. H. Dillon, of Firestone's physics research division, is shown operating the microscope. With him is F. W. Stavely, in charge of the research laboratory. Another member of the physics research organization, J. W. Liska, in a talk before the Detroit Rubber & Plastics Group on May 11, discussed the use of this instrument by Firestone and stated that pictures of zinc oxide at 20,000 diameters and channel black at 50,000 diameters lead to very interesting studies, as do micrographs of natural and synthetic latex particles. The future applications of the electron microscope are expected to be of tremendous importance, it was added. Some of the other instruments also available are an X-ray diffraction apparatus, a quartz spectrograph, and an infra-red spectrometer. Dr. Liska, in the above-mentioned talk, pointed out that characteristic X-ray patterns may be obtained from relaxed and stretched *Hevea* samples which indicate



J. H. Dillon Operating the Electron Microscope; Watching Is F. W. Stavely

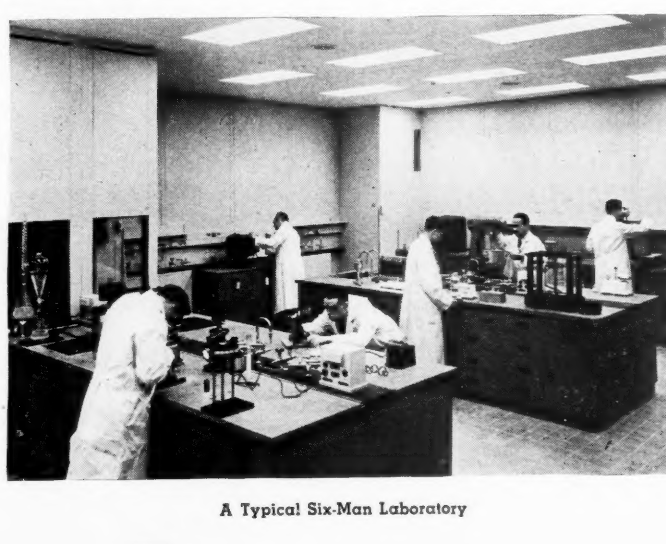
crystallization upon stretching and that the size of the crystal can be readily calculated from a set of such patterns. At 500% elongation GR-S does not show the characteristic spots in the X-ray picture, from which it is concluded that no crystallization occurs. The poor flexing of this material is attributed to its lack of crystallization on stretching.

Many of the instruments used in the Firestone laboratory were designed and built by Firestone scientists. The Firestone resonance vibrator, which subjects the samples to high frequency vibration forces, is used to determine dynamic modulus, hysteresis index at constant stress, static modulus, and hysteresis index at constant deflection. Unique properties are thus determined by this apparatus, giving results which are nearly independent of size or shape of sample or frequency of test. The application of these tests has been used in the solution of special problems involving heat generation of rubber at constant deflection or at constant stress.

Other Firestone developed instruments installed in the new laboratory include a plastometer, a relaxometer to study the effect of heat and oxygen on stretched rubber, and a low-temperature modulus test apparatus. More complete descriptions of these and other instruments and methods used by Firestone in research on rubber and plastics are described in articles[1] which have appeared in recent issues of INDIA RUBBER WORLD. These articles explain some of the work being done on stress relaxation, low-temperature bending modulus, static and dynamic modulus at low and high frequencies, and the resistance of synthetic rubbers to ultra-violet rays, ozone acids, gas diffusion, and oils and coolants.

In addition to the usual laboratory facilities for milling, compounding, curing, and testing experimental rubber and plastic stocks, another department of the laboratory is devoted to research and compounding and testing of natural and synthetic rubber latices. Many novel features for handling the latices and compounding ingredients used are found in this department.

Certainly improvements in the quality of present rubber and plastic products and an increase in the number and type of products produced in the postwar years may reasonably be expected from new facilities of this sort which are being provided with notable frequency throughout the industry.



A Typical Six-Man Laboratory

[1] Apr., 1945, pp. 59-64, 66; May, pp. 181-84, 186-90; June, pp. 313-16.

Northern California June Meeting

A MEETING of the Northern California Rubber Group was held in the Hotel Claremont, Berkeley, Calif., June 28. The main feature of the program was a talk on "New Developments on Guayule" presented by Geo. W. Miller of the Department of Agriculture. Guests introduced to the members included John Mason, Bill Graham, and Messrs. Ward and Fischer.

Lyn Shafer, the program chairman, introduced Mr. Miller, who first reviewed the history of the development of guayule, mentioning production during the years 1909 and 1910 in Mexico and the work of W. B. McCallum in 1912 in developing the production of guayule in Southern California. Mr. Miller also mentioned the present plans for processing the shrub on the 30,000 acres now planted in California and the plants available and to be constructed for this purpose. The speaker outlined the course of future developments for guayule rubber which included the elimination of preextraction conditioning, a study of various methods of deresination such as with alcoholic potassium hydroxide, by bacterial action on chopped shrub (shrub retting), the substitution of the Jordan paper mill for the pebble mill in processing the shrub, and the extraction of the guayule rubber as latex, and also the planned improvement in quality of the finished rubber.

Plans for the summer outing of the Group were discussed, and a letter from Herman Jordan describing the program for the outing was read. For the September meeting of the Group, a program on "New Developments in Synthetic Rubbers" by members of the Shell Development Co. is scheduled, and for the October and November meetings a discussion on carbon black by a representative of the Binney & Smith Co. and a talk on "Development of Synthetics as Related to Tires" by E. W. Booz, of Pacific Rubber & Tire Co., have been arranged for.

A door prize of $5 in War Savings Stamps donated by Pioneer Rubber Mills was won by Paul Rebe.

Evans and Eskew Speakers

THE June 15 meeting of the Philadelphia Rubber Group, at the Benjamin Franklin Hotel, Philadelphia, Pa., was attended by 116 members and guests. The speakers of the evening were H. G. Evans, of Stanco Distributors, Inc., who discussed "Postwar Synthetic Rubbers," and Roderick Eskew, of the Eastern Regional Research Laboratories of the United States Department of Agriculture, who spoke on "Domestic Sources of Natural Rubber." A cocktail hour preceded dinner, and entertainment during and following dinner was provided by a professional magician.

Mr. Evans gave a short outline of the manufacture of polymers by low-temperature bulk polymerization and by polymerization in solution. The types and properties of some of the polymers of the future were discussed, and the possible uses of Butyl synthetic rubber in the postwar period was described.

Mr. Eskew provided a very comprehensive picture of the sources of natural rubber investigated by the Eastern Regional Research Laboratories. The preliminary investigations, pilot-plant installations, and final semi-production units were explained in some detail. Guayule and *Cryptostegia* were described as outstanding sources of natural rubber that could be grown in this country, and the Russian dandelion or *kok-saghyz* also was reported to show promise because of its rapid growth and high yield.

The next meeting of the Group, planned for September, will be in the form of an outing at some nearby country club and will feature golf and other entertainment.

Boston Group Outing

THE summer outing of the Boston Rubber Group was held June 22 at the Woodland Country Club, Newton, Mass. A varied program consisting of a golf tournament, soft ball game, dart throwing, and hoseshoe pitching was enjoyed by the 380 members present. The lobster dinner was preceded by a cocktail hour, and following dinner community singing led by John P. Hach, accompanied by Ralph W. Davis at the piano, was one of the features of the evening.

Besides door prizes distributed to everyone present, prizes for the winners of the various contests, made possible by contributions from about 150 supply and rubber companies, were awarded as follows: For golf, the first prize, kicker's handicap, a $25 War Bond, went to Frank Ward; while the second prize of a golf jacket was won by E. L. Hanna, and the third prize, three golf balls, to R. B. Patterson. For low gross, the first prize of a $25 War Bond was received by "Hank" Bainbridge; the second prize, six golf balls, F. Fallwell, and the third prize, three golf balls, E. B. Curtis. The prizes and winners for the lowest net scores were: first prize, a leather toilet kit, Jack Sheehan; second prize, a golf jacket, J. W. Finley; and third prize, a $5 merchandise bond, A. J. Ryan. Prizes and winners for those players coming nearest the pin were: a golf jacket, first prize, A. B. Harding; second prize, a $5 merchandise bond, E. H. Garrison; third prize, an electric alarm clock, J. Andrews. A prize for the most 5's was presented to Al Ryan, for the most 8's to J. A. Williams, and for the highest score to B. Loveland.

In the dart throwing contest, the first prize went to B. A. Wilkes, the second prize to Charles Wilson, and the third prize to Tom Mahanna. In horseshoe pitching, first prizes were awarded to Don Wright and Ben Mayo, and second prizes to J. E. Stone and H. A. Hutchinson.

The soft ball game was won by Tom Ashley's "Bear Cats," who defeated Larry Shaw's "Wild Cats" by a score of 19 to 6.

Carl A. Meyer was the chairman of the committee for the outing.

Laboratory Directory under Way

COMPILATION is now under way for the eighth edition of the directory, "Industrial Research Laboratories in the United States," published by the National Research Council, Washington 25, D. C. The seventh issue, which appeared in 1940, contained data concerning the industrial research laboratories of 2,264 companies and their subsidiaries. With the intervention of five years between editions, it is expected that quite a number of new laboratories will be added.

Actoflux

ACTOFLUX is a new trade name in the rubber industry covering a series of non-toxic synthetic resinous high molecular weight copolymers or condensates varying from hard, crystalline-fracturing resins to amorphous-fracturing waxes or even viscous pastes. The final properties depend upon the relative proportion of the principal reactants, the type of catalyst, and the time and temperature of the reaction.

The two present commercial types, 1-S and 3-S, are of exact and unvarying composition which show valuable characteristics in the compounding of synthetic rubbers as well as natural rubber. They are compatible with GR-S, GR-M, GR-I, GR-A, "Thiokol," vinyl resins, acrylates, and other materials and offer valuable characteristics in the resulting vulcanizates. These new materials are essentially neutral so far as their pH is concerned, and the specific gravities of the series vary from 0.90 to 1.10.

No special storage precautions are necessary as the materials are extremely stable and do not contain or produce free acids or alkalies. They are insoluble in hot or cold water and are insoluble or sparingly soluble in oil, gasoline, benzene, alcohols, and most common solvents. In most elastomers the electrical properties are enhanced by the use of these resins since the material itself possesses excellent electrical resistivity.

One of the outstanding uses of the Actofluxes is in the preparation of Butyl (GR-I) stocks. In GR-I stocks 1-S acts a retarder-activator for quinone-dioxime (G.M.F.) cures and for combination quinone-dioxime-sulphur cures. It permits the safe use of the speedy, but scorchy G.M.F. compounds in plant processing by retarding acceleration at processing temperatures, but produces remarkably fast activation at curing temperatures. Safe processing innertube formulations can be cured in five or six minutes at 287° F. or less.

As an aid in the preparation of Butyl compounds, 1-S, in particular, assists considerably in the dispersion of pigments and is especially effective with channel blacks and hard clays. Since it acts without producing soft sticky stocks of poor sheet strength, more and harder blacks can be used than heretofore have been considered possible. The temperature, power consumption, and time of Banbury mixing are considerably reduced.

The retention of all physical properties during natural or oven aging (seven days at 158° F. or two days at 212° F.) is improved considerably by the use of the Actofluxes. The "growth" and cold flow of cured articles is minimized as well as their resistance to low temperature.

The plasticity of raw stocks as determined by Williams or Mooney instruments is practically unchanged by the use of these materials. The Caldwell Co., Akron, O.

First Outing of Phila. Group

THE Philadelphia Rubber Group will hold its first annual outing at the Oak Terrace Golf Club, Ambler, Pa., Friday afternoon, September 28. The program will include a golf tournament, swimming in an outdoor pool, and dinner and entertainment in the clubhouse in the evening. Indoor sport facilities are available in the various game rooms in the clubhouse. Wm. Dunlap, Jr., of the Lee Tire & Rubber Co., is chairman of the outing committee.

CALENDAR

July 27.	Chicago Rubber Group Golf Outing. Hickory Hills Country Club.
Sept. 13.	Detroit Rubber & Plastics Group, Inc.
Sept. 21.	New York Rubber Group. Building Trades Club, 2 Park Ave., New York, N. Y.
Sept. 27.	Northern California Rubber Group.
Sept. 28.	Philadelphia Rubber Group. Annual Outing. Oak Terrace Golf Club, Ambler, Pa.
Oct. 2.	Los Angeles Rubber Group, Inc.
Oct. 25.	Northern California Rubber Group.
Oct. 30.	Detroit Rubber & Plastics Group, Inc.
Nov. 2.	New York Rubber Group. Building Trades Club, 2 Park Ave., New York, N. Y.
Dec. 4.	Los Angeles Rubber Group, Inc.
Dec. 14.	Detroit Rubber & Plastics Group, Inc.
Dec. 14.	New York Rubber Group. Christmas Party. Building Trades Club, 2 Park Ave., New York, N. Y.

A.S.T.M. Developments

THE American Society for Testing Materials, 260 S. Broad St., Philadelphia 2, Pa., has authorized adoption as formal standard some 35 tentatives previously published and adoption of some 40 revisions in existing standards. At its forty-eighth meeting (annual) held in New York, N. Y., June 27, a one-session business meeting was held instead of the five-day meetings formerly held. Action on formal standards can only be taken at annual meetings; therefore a business session was imperative. Some of the tentatives approved include methods for identifying synthetic elastomers and a standard practice for conditioning rubber and plastic materials for low temperature testing.

New officers, whose terms are effective at the close of the annual meeting, are: president, J. R. Townsend, materials engineer, Bell Telephone Laboratories, New York; vice president, T. A. Boyd, head, fuel department, research laboratories division General Motors Corp., Detroit, Mich.; executive committee: John R. Freeman, Jr., technical manager, American Brass Co., Waterbury, Conn.; L. J. Markwardt, assistant director, U. S. Forest Products Laboratory, Madison, Wis.; Carlton H. Rose chemist, National Lead Co., research laboratories, Brooklyn, N. Y.; L. P. Spalding, chief research engineer, North American Aviation, Inc., Inglewood Calif.; and William A. Zinzow chief physicist, Bakelite Corp., Bloomfield, N. J.

Rhode Island Group Outing

THE Rhode Island Rubber Club held a very successful golf outing at the Wannamoisett Country Club, East Providence, R. I., June 29. Attendance totaled 80 persons, including about 15 guests. A cocktail hour preceded dinner at the clubhouse following the tournament, and golf and door prizes, made possible by contributions received from a large number of suppliers to the industry, were awarded after dinner.

A feature of the meeting was an ovation tendered E. L. Hanna, chief chemist, Davol Rubber Co., Providence; the occasion was Mr. Hanna's birthday. He has been an active member and has held several offices of the Rhode Island Rubber Club since its organization in the early '30's.

Prizes were awarded for the following scores: low gross, H. D. Bainbridge, Reichhold Chemical Co.; second low gross, R. S. Newell, Respro, Inc., H. B. Simmons, Industrial Paper & Cordage Co., and Ed. Colligan, Plymouth Rubber Co.; low net, C. R. Haynes, Binney & Smith Co.; second low net, Mr. Simmons; third low net, Mr. Jacobsen, United States Rubber Co., Bristol; blind bogey, F. S. Bartlett, U. S. Rubber, Bristol; highest hole, John MacLean, Davol, and F. R. Fitzpatrick, Respro; high gross, G. L. Ritchie, U. S. Rubber, Bristol; birdie on the 10th hole, Robert Cowen, U. S. Rubber Reclaiming Co.; most 4's, H. D. Bainbridge, Reichhold Chemical; most 5's, J. Breckley, Titanium Pigment Corp. and F. R. Fitzpatrick, Respro; most 6's, Mr. Hanna; low gross—guest, Wm. Stafford.

Tire Cord Tester in Use

A TIRE cord tension vibrator, which makes it possible to supplement information on tensile strength with new data on ability of the cord or fabric to withstand small stresses or "fatigue resistance," has been developed by The B. F. Goodrich Co., Akron, and is being manufactured and sold under license by the Ferry Machine Co., Kent, O. With this vibrator it is possible to change vibration rate for certain test needs, when the cord is subjected to vibration and (or) cyclic stresses. If necessary, heat is applied to the material under observation. E. T. Lessig, of the physical research staff of Goodrich, is the inventor; work was started by him when it was apparent that cord selection on the basis of tensile strength alone could not provide data which was completely reliable. In some instances the fatigue resistance of the used cord had decreased to the failure point while the tensile strength increased.

In determining fatigue resistance with this new machine, the test material is suspended under static load, and the upper grips are placed in rapid vertical oscillation; this can be made much faster than the natural frequency of the loaded cord so that the lower weights cannot respond.

Test conditions may be altered through a change in vibrations, static load, and lengths of materials under test. It has been found that, with tire cord, the test more closely paralleled actual tire conditions when the vibrating cords were subjected to heat; a temperature of about 250° F., is most suitable, and 180 to 340° temperatures also are satisfactory.

Calendering Plastics

(Continued from page 596)

vinyl chloride compounds or vinyl chloride-acetate resin compounds, it is generally assumed that processing has been satisfactory when a calendered sheet exhibits less than 14%, and an extruded tube less than 4%, shrinkage when exposed to a temperature of 302° F. (150° C.) for 30 minutes with free movement provided for. It may also be said that calendered or extruded material has been properly processed when the ultimate elongation of a sample of the product is 75% or more of the ultimate elongation of a properly molded tensile sheet of the identical compound. Tensile strengths, as a general rule, are not so sensitive to processing changes and are therefore not considered valuable as criteria.

It is often quite difficult for the calender or extrusion processor to determine accurately at just what temperature he should operate since for many materials the flow point and the thermal breakdown temperatures are very close. With some materials the presence of iron or certain metallic salts will actually invert these two temperatures, making proper processing impossible. It is essential in these cases that the processor follow to the letter the recommendation of the resin supplier.

In extruding, as in molding, it is essential that adequate pressure be applied to the material at the proper point to insure delivery of the desired shape. This is obtained by means of a temperature gradient on the barrel of the extruder, from low at the rear to flow temperature at the die, as well as by maintaining a differential friction ratio between the worm and the cylinder walls. This is generally accomplished by the use of a cored worm maintained by steam and water at a temperature approximately equivalent to that temperature employed at the feed, or throat, section of the extruder. Inasmuch as large extruders have a tendency to overheat the plastic material, owing to internal friction, it is frequently necessary to keep cooling water on the worm for additional cooling capacity.

Additional pressure may be secured within the extruder by means of a breaker plate and screens, which also serve to remove any foreign materials that may be present.

Moisture should be avoided for it adversely affects the extrusion of most thermoplastics. Where mill-fed stock is used, moisture is no problem, but the use of granular feed often necessitates some form of predrying, which may incidentally further aid in the extrusion if applied directly before feeding so as to provide hot feed to the machine.

Calendering is perhaps the least complicated processing method of all; the major problem is to supply heat to the compound as fast as it is dissipated from the large surface areas involved. Balanced against that is the necessity of exercising a certain amount of caution in heating, since overheating may cause the compound to stick tightly to the roll. Almost all calendering compounds are internally lubricated to guard against sticking, however, thus enabling the processor to operate at temperatures in excess of those which would normally cause sticking.

Rubberized Industrial Coating

NUKEM SEALTEX, a compounded rubberized plastic for the protection of wood, steel, and masonry against the corrosive action of many commercial acids and alkalies, is said to provide a flexible, impervious coating. It has a softening point of approximately 275° F. It is easily applied by spray or trowel, sets quickly, and is ready for use within 24 hours. Nine gallons of Sealtex will cover 100 square feet of surface to a 1/8-inch thickness.

RUBBER WORLD

NEWS of the MONTH

Highlights—

The resignation of John L. Collyer and J. E. Trainer, as Special Director and Assistant Director (respectively) of Rubber Programs for the War Production Board, delayed until the termination of the strikes at the Goodyear and the Firestone plants in Akron, O., became official July 18. Both of these men are returning to their respective companies. Robert S. Wilson, vice president, Goodyear Tire & Rubber Co., is the new head of the government's rubber programs; while George M. Tisdale, vice president, United States Rubber Co., will act as Assistant Director.

The "Report of the Special Director of Rubber Programs to the War Production Board," dated June 25, but made public July 18 by Mr. Collyer, stressed the fact that military and minimum essential civilian requirements for tires and other rubber products can be met during 1945 and 1946, through programs and policies now in effect.

On July 16 and 20, cancellation of 21 truck-tire tube and 12 major truck-tire expansion projects, having an estimated total cost of $110,000,000, was announced by deputy director of the WPB Rubber Bureau, W. James Sears. Cutbacks in 25 smaller truck-tire projects and the cancellation of five bogie tire expansions were revealed at the same time.

The strike at Goodyear's Akron plants was ended July 5 when the Navy took possession of the plants by order of President Truman, and the strike at the Akron plants of the Firestone Tire & Rubber Co. was ended voluntarily by a vote of the Firestone local union on July 14. Nearly 500,000 tires and an almost equal number of tubes were not produced as a result of these strikes.

Reports on the German rubber industry and its products are being written under the direction of the WPB Rubber Bureau and will be published jointly by INDIA RUBBER WORLD and Rubber Age, starting with the September issue in the first case and with the August issue in the second. Four reports are to be published, one each on tires, mechanical goods, wire and cable, and drug sundries.

The Rubber Reserve Co. on July 2, in making public a study entitled, "Report on the Rubber Program 1940-1945," reviewed the program of this RFC agency and provided a thorough survey of past efforts and the latest information on the production of natural and synthetic rubber during the period indicated.

Robert S. Wilson

Collyer and Trainer Resign; Wilson and Tisdale Appointed

The resignations of John L. Collyer and J. E. Trainer, Director and Assistant Director (respectively) of Rubber Programs of the WPB, planned for June 25, were finally made public on July 18, following the ending of the Goodyear and the Firestone strikes at Akron, O.

In a letter to J. A. Krug, WPB chairman, Mr. Collyer stated that he felt the particular tasks outlined at the time of his accepting the position of Special Director of Rubber Programs in March, had been completed. He added, however, that much work of a continuing nature was required to keep in balance the complex programs for producing military and essential civilian tires and other products and, at the same time, providing our Armed Forces with the equipment required to prosecute offensive warfare against Japan; therefore he recommended that a Director of Rubber Programs be a continuing officer on Mr. Krug's staff.

Mr. Collyer, president of The B. F. Goodrich Co., is being succeeded as Rubber Director by Robert S. Wilson, vice president of the Goodyear Tire & Rubber Co. Mr. Wilson will have as his Assistant Director, George M. Tisdale, vice president of the United States Rubber Co., who will take the place vacated by J. Edward Trainer, vice president of the Firestone Tire & Rubber Co., who is also returning to his company.

Mr. Wilson has been with the Goodyear company since 1912. He served as advertising manager before being elected vice president and sales manager in 1928. He has had wide experience in the selling and merchandising of automotive and mechanical rubber goods and in associated lines of shoe products, packaging, flooring, plastics, and synthetic rubbers.

Mr. Tisdale joined United States Rubber Co. in 1920, and since 1929 until his appointment as vice president in 1944, he served as director of purchases for the company. He was also made a member of the board of directors and of the executive committee of the company in 1944.

Special Director's Rubber Programs Report

The somewhat more stable conditions in the rubber industry in late July also made possible the release of "Report of the Special Director of Rubber Programs to the War Production Board" by John L. Collyer on July 18. In this report Mr. Collyer said that the two major obectives established when he came to Washington: namely, to return industry to January levels of synthetic and natural rubber consumption and to January product specifications in terms of carbon black and to attain product capacities and actual levels of output necessary to meet military and essential civilian needs in 1945 and 1946 had been reached or recommendations had been made which, if carried out, would reach these objectives. He reported that the rubber industry in May processed 73,100 tons of synthetic and natural rubbers, almost equal to the year's high consumption of 76,349 tons in January.

Truck Tires

With regard to actual and estimated production output for truck tires, the tables given below were provided to show that this situation was such that there will be enough in some sizes, and a continuing shortage in other sizes, unless the war against Japan results in a lower consumption of these tires than anticipated or new sources of supply of natural rubber are obtained sooner than expected.

Actual production of truck tires of each size group in each quarter of 1944 and in the first two quarters of 1945 is shown in Table 1.

The present outlook on requirements and production of total truck and bus tires is shown in Table 2 for each of the next four quarters. Mr. Collyer's report also included the same information for each of the seven size groups, but these are not listed here.

These figures show that for total truck tires A-1 through A-6 surpluses over screened requirements exist in each quarter. However for A-3a, A-3b, and A-4, there are substantial deficits in the last half of 1945.

Passenger-Car and Farm Tractor and Implement Tires

Passenger car tire production in the fourth quarter of 1944 was revealed as 6,368,000 units, bringing the 1944 total output to 18,900,000 tires. Production for the first quarter of 1945 was 5,056,000 and was planned for 5,200,000 units for the second quarter of this year. The report states that it is the objective to attain rates of production of 7,000,000 units for the third quarter of 1945 and 8,000,000 units for the fourth quarter of the present year, which should provide over 25,000,000 passenger car tires in 1945.

Production of farm tires, which are largely for civilian use, reached the figure of 2,105,000 units for 1944. Output increased in the first quarter of 1945 to 639,918 tires, in spite of the shortages of component materials and will reach an estimated level of 500,000 units in the second quarter, it was stated. Output of these tires for the year 1945 are estimated

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TABLE 1. IN UNITS

Tire Size Group	1944 1st Qtr	1944 2nd Qtr.	1944 3rd Qtr.	1944 4th Qtr.	1944 Year	1945 1st Qtr.	1945 2nd Qtr.
A-1 Combat Runflat....	51,640	18,114	19,573	35,480	124,807	33,336	29,000
A-2 16.00 and up.......	9,121	8,329	9,184	11,323	37,957	11,303	10,000
A-3a 12.00 through 14.00	......	......	......	82,096	2,732,940	959,753	943,000
A-3b 9.00 through 11.00	575,613	604,555	718,401	752,275		98,111	97,000
A-4 10 ply through 8.25.	597,919	594,797	568,012	610,240	2,370,968	807,732	830,000
Sub-Total A1 through A4	1,234,293	1,225,795	1,315,170	1,491,414	5,266,672	1,910,235	1,909,000
A-5 8 ply and under....	1,469,591	1,471,953	1,434,494	1,541,842	5,917,880	2,089,242	2,022,000
A-6 15" and 16".......	894,398	862,700	812,713	869,974	3,439,776	1,392,368	946,000
Total Truck-Bus	3,598,273	3,560,448	3,562,377	3,903,230	14,624,328	5,391,845	4,877,000
Finished Tire Weights				In Tons			
A-1 through A-4.......	50,900	53,700	59,100	68,200	231,900	85,800	85,000
Total Truck-Bus	104,900	107,300	110,900	123,900	447,000	164,400	155,100

TABLE 2. TOTAL TRUCK-BUS TIRES
(Units)

	1945 3rd Qtr.	1945 4th Qtr.	1946 1st Qtr.	1946 2nd Qtr.
Screened Requirements				
Civilian Original Equip. (ODT)...........	618,800	1,070,000	1,290,000	1,420,000
Civilian Replacement (ODT)	1,863,857	1,666,841	1,464,041	1,556,041
Total Civilian (ODT)	2,482,657	2,736,841	2,754,041	2,976,041
All Other Claimants	2,025,372	2,298,723	2,205,065	2,095,222
Total Screened Requirements............	4,508,029	5,035,564	4,959,106	5,071,263
Scheduled Production Rate......................	4,931,719	5,102,562	5,416,602	5,403,995
Excess of (Deficiency) of supply *vs.* Screened Requirements	+423,690	+66,998	+457,496	+332,732

TABLE 3. ARMY TRUCK TIRE REQUIREMENTS, THIRD QUARTER, 1945, AS STATED AT VARIOUS DATES
November, 1944 = 100%

	Two-War Truck Tire Requirements Nov., 1944	Two-War Truck Tire Requirements Feb., 1945	Post V-E-Day Truck Tire Requirements May, 1945	Post V-E-Day Truck Tire Requirements June, 1945
A-1 Combat-Runflat	100%	196%	11%	2%
A-2 16.00 and up.........................	100%	165%	89%	89%
A-3a 12.00 through 14.00.................	100%	179%	175%	171%
A-3b 9.00 through 11.00..................	100%	249%	159%	152%
A-4 10 ply through 8.25...................	100%	169%	39%	36%
Sub-total A-1 through A-4................	100%	226%	145%	138%
A-5 6 and 8 ply through 7.50...............	100%	159%	107%	71%
A-6 15" and 16"........................	100%	116%	43%	34%
Sub-total A-5 and A-6.....................	100%	146%	88%	60%
Total Truck Tires	100%	162%	99%	76%

as 2,300,000 units, which it was pointed out should provide an adequate supply.

Synthetic and Natural Rubber

Latest estimates based on revisions of the military and civilian needs indicate a domestic need of synthetic and natural rubbers of 1,045,489 tons in 1946. Of this total, approximately 907,295 tons will be synthetic rubber. To meet this increased synthetic rubber demand, improvements in the government synthetic rubber plants which will increase our national annual capacity from 1,000,000 tons to 1,200,000 tons by 1946 are being made.

Natural rubber usage is still in excess of imports from the few producing territories in Allied hands, resulting in a reduction of our limited stockpile to only 66,000 tons at the end of 1945. *Thus, natural rubber constitutes the most serious single obstacle to the attainment of 1946 production objectives,* the report emphasizes strongly. The problem is being attacked from two sides —increasing supplies of natural rubber and decreasing usage. Reference was made to the harvesting by 1947 of all the available guayule rubber in this country and the extension of the contracts of the Rubber Development Corp. with the various South and Central American countries for the production of wild rubber, beyond the original termination dates, which ranged from March through December, 1946.

Hope for essential natural rubber supplies some months hence lies in the prompt liberations of certain Far Eastern rubber producing territories. Operating supplies and incentive goods, which are vital to the resumption of rubber production, are ready for movement into liberated areas as soon as military progress warrants. Mechanical equipment is being programmed for washing and drying natural rubber in this country, since it is feared that prewar equipment of rubber producing areas will have been destroyed or stolen by the enemy, Mr. Collyer said. Despite these steps all possible conservation is required, and industry technical advisory committees have been active for some weeks seeking means of further substitution of synthetic for natural rubber.

Carbon Black and Textile Position

The carbon black shortage, which was so critical in February and March as to interfere with tire production both quantitatively and qualitatively, is much improved. Production has increased from 69,200,000 pounds in February to about 99,300,000 pounds estimated for the end of June, and when the new plants which are being expedited have reached full operating levels, it is estimated that carbon black production (rubber types) will be 122,000,000 pounds—enough to care for all estimated U. S. A. needs and provide about 17,000,000 pounds a month for export. Credit for this improved situation was given to the WPB Chemical Bureau and the Inter-Agency Committee on Carbon Black. The Combined Raw Materials Board has under consideration the need of any additional carbon black capacity that might be required by virtue of a large foreign carbon black requirement resulting from the resumption of large-scale rubber products manufacture abroad.

The overall textile position of the rubber industry is still tight, though improvement has been effected in some areas. The supply of chafer fabric for tires is improved, but cotton tire cord is short entirely as a result of manpower deficiencies. Cotton textiles for footwear, tape, hose, belting, and other classes of products are substantially short of needs.

The supply position of rayon tire cord is and will remain tight, but, if new facilities come in on schedule and if production of existing plants is brought to capacity, we should be able to squeeze by, it was said. Special attention is being given to the expediting of new facilities, for which the Rubber Bureau, in April, assumed responsibility.

Component Position—Future Estimates

An industry study of the component materials requirements for 1945-46 on the approximately 2,000 items used by the rubber industry in addition to those already mentioned has been conducted through The Rubber Manufacturers Association, Inc., and supplied the WPB Rubber Bureau. This study combines estimates of many individual companies of all their component materials needs and makes possible the development of usage factors by means of which the Rubber Bureau, with reasonable accuracy, can determine the industry's component materials requirements for any given level of rubber consumption.

Independently, the Rubber Bureau has studied major component material supplies under several possible rubber products manufacturing schedules involving the various tire expansion programs and with desired or with degraded product specifications, it was also reported.

Tire Requirements

Under this heading, the very fluid situation which existed between November, 1944, and June, 1945, with regard to the demand and supply of military and essential civilian tires was discussed, and it was revealed that in order to handle developments here most efficiently, J. E. Trainer, Assistant to the Special Rubber Director, had been attached to the Army Ordnance Department.

The figures in Table 3 show the extent to which Army tire requirements for the third quarter of 1945 varied from November, 1944, to February, 1945, on the assumption of a continuance of both wars and from May to June, 1945, when showing needs for the Japanese war only. Figures are percentages, with those submitted in November representing 100%.

Attention was called to the fact that while these figures apply to one quarter only, they are representative of changes that have occurred in the stated requirements for other quarters. Their wide and non-uniform fluctuations, by size groups and in total, make clear the near impossibility of proper preplanning of production and capacities, it was added.

It was also emphasized that in spite of the important reduction in requirements for total tires, the current one-war needs for the large volume, large-size A-3a and A-3b tires, are *respectively, 71% and 52% greater* than the November two-war requirements on which the December-January plant expansion program was based. For large tires as a group (A-1 through A-4) current requirements are 38% above

those filed in November. *The effect of these size shifts is such that, although units are down 24% below the November level, total tire tonnage required is practically the same as in November.*

The measurement of the 1945-46 minimum essential civilian tire requirements, an important part of total requirements, is another phase of the problem which has received major attention. On March 30 a request was addressed to the RMA for the assistance of qualified industry representatives to conduct a study of civilian tire needs. The study, completed April 27, covered needs for truck, bus, and passenger-car tires. A similar study of civilian farm-tire requirements was completed on June 6. The resulting estimates of minimum essential civilian needs have met general acceptance of all major points and have become the basis for the 1945-46 civilian tire program, it was said. These minimum U. S. A. civilian *replacement* needs are:

Civilian Replacements of:	1945	1946
Truck-Bus Tires	6,300,000	5,500,000
Passenger Tires	20,000,000	22,000,000
Farm Tractor & Implement Tires ...	733,000	801,000
Total Civilian Tires.	27,033,000	28,301,000

Civilian original equipment tire requirements may be expected to fluctuate depending on the degree to which new vehicle production allotments are translated into actual production.

Tire Capacity

The separate expansions of tire manufacturing capacity made or planned during the war were reviewed under this heading, and then it was stated that if all these expansions had been permitted to go on to completion, there would have been a total truck and bus tire capacity in the United States or more than 30,000,000 units a year, as compared with the highest production of truck tires ever attained in peacetime of only 8,500,000 units in 1940. Cancellation of the majority of these projects was discussed, and it was revealed that the responsibility for expediting construction of the uncancelled tire expansion projects was taken over in June by the WPB Rubber Bureau.

Of special interest was the statement that the studies of minimum essential civilian needs of passenger-car and farm tires indicate that during and after the war existing and programmed mechanical capacity are sufficient. For the war period, aggressive tire conservation measures should be continued. The possible hindrances to attainment of planned production schedules are shortages of components and manpower, or unexpected large increases in military truck-bus and airplane tire requirements and allotments.

Manpower

One of the most serious problems now facing the rubber industry is that of manpower—manpower for the production of rubber products and manpower for the production of components that go into such products, Mr. Collyer's report states. The problem breaks down into three phases: (1) getting the required number of physically qualified workers; (2) keeping the workers on the job through major reductions in absenteeism and work-stoppage losses; (3) producing more product per unit of equipment and per man per day.

As of June 9 the manpower needs of truck tire and major components production were:

		Workers
Total truck and bus tires........		4,300
Certain major components:		
Existing reclaim rubber plants.	360	
Existing rayon plants........	503	
Existing cotton cord plants....	3,202	
Existing chafer fabric plants..	241	
Sub-total		4,306
Total		8,606

In addition to the shortage of 8,606 workers stated above, manpower needs also exist for facilities producing essential non-tire rubber products, for the replacement of turnover in all categories of facilities, and for staffing new expansions, as completed, in the tire and component materials fields.

Steps taken by the Rubber Bureau to aid in securing a high percentage of draft deferments were reviewed, and work-stoppages and absenteeism in the second quarter were then commented on. Where, from February through April, production was adversely affected primarily by component materials shortages, the current and future bottleneck is manpower in number and skills, it was pointed out.

Rubber Organization

Since successful administration of the government's rubber programs requires the effective cooperation of many agencies of the government and of several bureaus within the WPB, and because of the multiplicity of policy relations with these many sections of the government, Mr. Collyer recommended strongly the appointment of a permanent Director of Rubber Programs attached to the staff of the WPB Chairman.

The Rubber Bureau, itsef, has been substantially strengthened during the last three months. Nearly all part-time consultant connections with industry representatives have been severed.

Reference was made to the Industry Advisory Committee which by its monthly meetings has provided substantial benefits in counsel and understanding between industry and government.

Summary of Problems Ahead

Mr. Collyer's report concluded with a listing of problems of current and future importance, which require constant study and attention if balance is to be continued between the many complicated parts that comprise the rubber programs, including:

1. Assisting industry in filling immediate and prospective manpower needs, for rubber products and component materials plants, to realize the heavy production schedules planned. It is of vital importance that all production equipment be kept in operation six full days a week, and, when necessary, seven.
2. Overcoming, as quickly as possible, the critical current shortage of large truck tires of the A-3a and A-3b size-groups, for both military and essential civilian use.
3. Offsetting in every way possible the prospective natural rubber problem of 1946 by:
   (a) Centering the attention of the appropriate military authorities on the necessity of gaining new rubber sources in the very near future.
   (b) Working with proper U. S. A. government authorities to assist liberated territorial governments with supplies for gathering and preparing rubber for shipment.
   (c) Following up on installations of washing and drying equipment to insure having enough rubber, in usable condition, on time.
4. Insuring against fall-downs on rayon production schedules or delays in construction of rayon expansion projects.
5. Continuing to study component materials requirements and supplies so that possible bottlenecks may be foreseen and acted upon before they become serious.
6. Continuing to work cooperatively with claimant agencies in the estimation of rubber products requirements so that balance can be maintained.
7. Expediting construction of large tire, carbon black, synthetic rubber, rayon guayule and rubber washing plants now under way.
8. Maintaining the improved, but minimum essential civilian tire position established for the third quarter of 1945.
9. Above all, maintaining a strong government rubber organization, equipped with the experience, standing, and authority necessary to cope successfully with the complicated rubber problems.

Tire and Tube Plant Cancellations

On July 16, W. James Sears, deputy director of the WPB Rubber Bureau, announced that 21 expansion projects for the manufacture of truck-tire tubes and two projects for making air curing bags and tire flaps had been cancelled. Three factors entered into the decision to cancel the tube projects, it was said: The reduced requirements of the Armed Forces; the fact that increased production has been obtained from present facilities because improved techniques and methods of processing Butyl rubber developed in the past year have reduced the time consumed in the manufacture of tubes; and that more flexibility is possible in the production of tubes than in tires and production schedules can be revised from time to time without the necessity of having a substantial amount of additional equipment available.

The expansions authorized by the Defense Plant Corp. on which work had begun but was not yet completed, would have had a total cost of about $11,000,000.

Tube cancellations, with companies and location of facilities involved, follow:

Agent for the Government — Goodyear Tire & Rubber Co., *Location* — Topeka, Kan.; Lee Tire & Rubber Co., Conshohocken, Pa.; Master Tire & Rubber Co., Findlay, Ohio.; Norwalk Tire & Rubber Co., Norwalk, Conn.; Pennsylvania Rubber Co., Jeannette, Pa.; Armstrong Tire & Rubber Co., Natchez, Miss.; Dayton Rubber Mfg. Co., Dayton, Ohio.; General Tire & Rubber Co., Akron, O., and Waco, Texas; Goodyear Tire & Rubber Co., Gadsden, Ala.; Mansfield Tire & Rubber Co., Mansfield, Ohio; Oliver Tire & Rubber Co., Emeryville, Calif.; Robbins Tire & Rubber Co., Tuscumbia, Ala.; Seiberling Rubber Co., Barberton, Ohio; United States Rubber Co., Eau Claire, Wis., and Chicopee Falls, Mass.; Firestone Tire & Rubber Co., Pottstown, Pa.; The B. F. Goodrich Co., Tuscaloosa, Ala.; Goodyear Tire & Rubber Co., Nashville, Tenn.; Inland Rubber Corp., Ottawa, Ill.; Kelly-Springfield Tire Co., Houston, Tex.; Lee Tire & Rubber Co., Kansas City, Kan.; Carlisle Tire & Rubber Co., Carlisle, Pa.

Flap and air-curing bag cancellations,

with companies and location of facilities involved, are:

Agent for the Government — Firestone Tire & Rubber Co., *Location* — Pottstown, Pa.; Textile Rubber Co., Bowdon, Ga.

Truck Tire Plant Cancellations

On July 20, Mr. Sears also announced that 12 government authorized expansion projects for large truck tires, completion of which would have cost $86,000,000, had also been cancelled. Six are new plants, wholly federally financed, and six are projects where additional plants and equipment were being constructed adjacent to existing factories, with varying percentages of public and private funds. Five bogie-wheel tire projects also have been cancelled.

Revisions and cutbacks for truck and bus tires made possible since VE Day have now reduced the previous requirements figure from 30,000,000 to 20,000,000 of these tires needed per year, and the truck tire expansion program has been adjusted as rapidly as possible to this new production rate. Besides these cancellations previous decisions to reduce the planned production capacity in the smaller truck tire sizes have been made. Military requirements in bogie wheel, support wheel, and idler tires for tanks and half-tracks have been sharply reduced. Manufacturers capacity now in operation is sufficient to fill the demand, it was reported.

"The estimated overall total cost of all the military truck tire expansions approved in December, 1944, and January, 1945, would have been $132,000,000 had they been completed. The estimated cost of projects cancelled prior to today would have amounted to $24,000,000.

"Therefore, $110,000,000 of plant expansions have been cancelled. Only $22,000,000 of the original programs remain to be completed."

The complete list of expansions cancelled follows:

Bogie Tire Expansions Cancelled

Agent for Government — Firestone Tire Co., *Location* — Akron, O.; Dayton Rubber Mfg. Co., Dayton, O.; United States Rubber Co., Detroit, Mich.; Firestone Tire & Rubber Co., Pottstown, Pa.; Goodyear Tire & Rubber Co., Nashville, Tenn.

New Building Projects Cancelled Completely

Agents for the Government — Lee Rubber & Tire Corp., *Location* — Kansas City, Kan.; Inland Rubber Corp., Ottawa, Ill.; Kelly-Springfield Tire Co., Houston, Tex.; Goodyear Tire & Rubber Co., Nashville, Tenn.; The B. F. Goodrich Co., Tuscaloosa, Ala.; Firestone Tire & Rubber Co., Pottstown, Pa.

Projects Involving Additional Buildings and Equipment Cancelled

Agent for the Government or Owning Company — Firestone Tire & Rubber Co., *Location,* — Los Angeles, Calif.; United States Rubber Co., Detroit, Mich.; United States Rubber Co., Eau Claire, Wis.; Mansfield Tire & Rubber Co. (2nd project), Mansfield, O.; Goodyear Tire & Rubber Co., Gadsden, Ala.; General Tire & Rubber Co., Waco, Tex.

Smaller Truck Tire-Projects Cut Back

Agent for the Government or Owning Company	*Percentage of Cancellation to Entire Project*	*Location*
Goodyear Tire & Rubber Co.	100.0	Akron, O.
Mohawk Rubber Co.	100.0	Chattanooga, Tenn.
Dayton Rubber Co.	64.2	Dayton, O.
Denman Tire & Rubber Co.	61.6	Warren, O.
Pennsylvania Rubber Co.	60.8	Jeannette, Pa.
Firestone Tire & Rubber Co.	55.6	Memphis, Tenn.
Seiberling Rubber Co.	50.1	Barbeton, O.
Firestone Tire & Rubber Co.	46.9	Los Angeles, Calif.
United States Rubber Co.	45.0	Detroit, Mich.
Armstrong Tire & Rubber Co.	43.9	Natchez, Miss.
Master Tire & Rubber Corp.	43.5	Findlay, O.
Goodyear Tire & Rubber Co.	41.2	Topeka, Kan.
Mansfield Tire & Rubber Co.	40.2	Mansfield, O.
Armstrong Rubber Co.	39.0	West Haven, Conn.
The B. F. Goodrich Co.	39.0	Tuscaloosa, Ala.
Norwalk Tire & Rubber Co.	36.7	Norwalk, Conn.
Pacific Rubber & Tire Mfg. Co.	28.5	Oakland, Calif.
Firestone Tire & Rubber Co.	23.5	Pottstown, Pa.
Kelly-Springfield Tire Co.	21.6	Houston, Tex.
Lee Rubber & Tire Corp.	20.3	Kansas City, Kan.
Pharis Tire & Rubber Co.	18.1	Newark, O.
General Tire & Rubber Co.	16.3	Akron, O., and Waco, Tex.
Lee Rubber & Tire Corp.	12.7	Conshohocken, Pa.
Lake Shore Tire & Rubber Co.	10.5	Des Moines, Iowa
Firestone Tire & Rubber Co.	1.3	Akron, O.

Akron Strikes Ended; Production Loss Great

The strikes at the Akron plants of the Goodyear Tire & Rubber Co. and the Firestone Tire & Rubber Co., the former which began on June 17 and was terminated on July 5 when the Navy took over operation of the plant by order of President Truman, and the latter which began on July 1 and was ended on July 14 when the Firestone local union voted to return to work voluntarily, resulted in a production loss of nearly 500,000 tires and almost an equal number of tubes, most of which were urgently needed for use by the Armed Services.

The workers at the Goodyear plants defied all requests and orders of their international union officers, the Governor of the State of Ohio, the War Labor Board, and the War and Navy Departments; so finally President Truman on July 4 signed an executive order directing the U. S. Navy to "take possession and operate" the Akron plants of the Goodyear Tire & Rubber Co. This order was obeyed on July 5 by Capt. H. K. Clark, U.S.N.R. Attendance on July 7 was termed "good" by Captain Clark, and production gradually reached normal without much difficulty.

The strike at the Firestone plants was voted at a meeting of Local No. 7 of the United Rubber Workers of America (CIO) at a meeting held July 1. The workers heard a report of negotiations that had been going on between the company and the union since the strike action was voted at the NLRB supervised election June 18. The workers refused to accept the report of the negotiating committee which submitted the results of discussion of grievance points with the Firestone company and the proposed solutions. The local union members then voted about three to two in favor of a general strike. In a prepared statement the executive committee of this Local No. 7 said in part:

"In a mass meeting today, Sunday, July 1, the members of Firestone Local 7 indicated that they would not continue to work without a labor agreement between the union and the company. The workers overwhelmingly voted to reject the impossible proposals which were all the company would offer after three months of negotiations.

"After these extended negotiations the company advised us that they would refuse to concede any ground on 36 points in dispute.

"The membership also voted to refuse to submit these items in dispute to the War Labor Board. The members have no confidence in that Board. The employes have come to appreciate the fact that a powerful company such as the Firestone Tire & Rubber Co. can prostitute the procedures and policies of that Board to its own end."

The Goodyear Strike

It is impossible to record here all the thousands of words written and statements issued during the course of these two strikes, but it is thought worthwhile to report some of the more significant items. For example, last month it was reported that C. V. Wheeler, president of the Goodyear local union, had taken the position that his union had never ratified the "no-strike" pledge as voted by the URWA at its national conventions during the last three years. Sherman H. Dalrymple, president of the international union, on June 24 issued a statement in which he said:

"A statement was made in a wire to the NWLB by the president of Local No. 2 that Local 2 tabled the no-strike pledge when same referred to local for ratification. We contend that such a statement to the NWLB from a representative of any local union is belittling.

"Certainly local unions do not have the authority to change or pass upon the laws governing our organization as adopted in conventions. All local unions are bound by action taken in convention and do not have the power to review, reverse or modify. Our organization is a democratic organization, and in convention our laws are made to be observed, not to be broken."

Mr. Dalrymple appealed to the members of Local 2 in an advertisement in the *Akron Beacon Journal* on June 27 to return to work "in order that their representatives be placed in a position to make final disposition of such grievances as may be pending; and in order that the best interests of the organization be advanced and protected." He also addressed the members of this local on June 28, but refused to ask the company to meet with the union until after the strike was ended.

Acting Secretary of War Robert P. Patterson and Assistant Secretary of the Navy H. Struve Hensel on June 30 appealed to the Goodyear strikers to return to work and said that "These plants produce one-third of all airplane tires and we have virtually no reserve stocks of some of the most critically needed types. . . . The operations of our carrier fleets are dependent on the prompt resumption of production of tires and other rubber equipment produced in these plants. Unless the planes now awaiting tires are started toward the Pacific at once, carrier operations will be adversely affected.

"These facts must make it obvious to every Goodyear worker that every minute he stays out on strike jeopardizes the lives of our fighting men and diminishes the force of our blows against Japan. In the name of the troops overseas we call upon these workers to return to their jobs at once."

Also on June 30, George W. Taylor, NWLB chairman, wired the Goodyear local that unless the strike was terminated by July 2, the NWLB would consider whether it should modify its directive orders in regard to maintenance of membership, check-off, shift premiums, and vacations. At the same time William H. Davis, director of the Office of Economic Stabilization, directed that occupational deferments for draft-age Goodyear strikers be cancelled and also directed that the draft status of other draft-age strikers, not now holding occupational deferments, be reexamined. The latter action was protested by the Goodyear local president in a telegram to President Truman as "un-American, Fascist and un-democratic."

Wires were sent to Senator Mead and President Truman jointly by C. V. Wheeler, of the Goodyear union, and I. H. Watson, of the Firestone union, following the beginning of the Firestone strike on July 1, asking that the conditions at the Goodyear and Firestone plants be investigated by the Senate Committee investigating the defense program in the first case and in the second asking that the President or some other responsible government agency order the Goodyear and Firestone companies to sit down and negotiate the hundreds of grievances which have caused these strikes. The Senate Committee, however, decided against any investgation, and President Truman on July 4 signed an executive order for government possession of the Goodyear plants.

The NWLB on July 3 issued an order suspending the Goodyear local union's shift premium pay and vacation privileges and on the same day advised the Firestone local union officers to use their "full authority" to end this new strike.

In his seizure order President Truman stated that he had found that the war effort "will be unduly impeded or delayed" by continued interruption of production at the Goodyear plants and authorized the Navy Secretary to hire employes, use company management, and take any other steps necessary to restore the plants to operation. He also directed that government possession should terminate "within 60 days" after the Secretary determines that "productive efficiency" has been restored.

The Firestone Strike

Following the end of the Goodyear strike, the NWLB on July 7 directed the workers at the Firestone plants to return to work or face disciplinary action. Mr. Dalrymple urged the members of this local union to return to work in a published statement in which he termed their strike "a grave mistake" and that "continuance of this strike will, no doubt, eventually conclude in the same way as the URWA Local 2—Goodyear, Akron—terminated yesterday. I am certain that if the Firestone workers thoroughly realize what this would mean to them, they would hasten to return to their jobs without a moment's further delay."

Without waiting for the officers of the Firestone local to decide whether or not they would go to Washington for a "show cause" hearing, the NWLB on July 8 subpoenaed four officers and four members of the local union's negotiating committee for an appearance before the Board in Washington on July 10. These members of the Firestone local returned to Akron after a stormy meeting with the NWLB at which the Board, in addition wanting to know why the Firestone strike had not been ended, also wanted to know why maintenance of membership, shift differential, and vacation privileges should not be suspended. This action was followed by a telegram on July 13 from the NWLB addressed to both the Firestone local union officers and the Firestone company in which it referred to the July 10 meeting in Washington and then said in conclusion:

"Unless the workers are back at work on Monday morning, July 16, 1945, the Board will immediately take action with respect to the question of revocation of vacation, shift premium, maintenance of membership provisions which were discussed at the public hearing. The parties are requested to make known the contents of this telegram to the striking employes."

The Firestone local met on July 14 to consider the NWLB ultimatum and also a plea by Governor Lausche of Ohio who appealed to the workers on the eve of the local union meeting to "go back to your war jobs—resume your posts of war." At this meeting the members of the Firestone local were reported to have voted three to one to return to work. One account of this meeting, however, stated that only 1,220 members of the 2,000 in attendance actually voted. The voting was preceded by a report of the union officers and negotiating committeemen of the public hearing in Washington and then a discussion by certain individual union members as to whether or not they were in favor of returning to work.

Production was reported as "virtually normal," while attendance was higher than usual at the Firestone Akron plants on July 16. The company and the local union immediately resumed negotiations on a new contract, and the NWLB on July 17 announced that a public hearing would be held August 8 to review the issues between the Firestone company and the URWA Local No. 7, CIO.

At another meeting on July 15 between the international URWA officers and the Firestone local union, Mr. Dalrymple agreed that a representative of the international union would participate in renewed contract negotiations between the union and the company.

Operations at Goodyear and Firestone

Meanwhile operations at the Akron Goodyear plants under Navy Control proceeded reasonably well. The NWLB rejected a new grievance procedure planned by Capt. Clark and worked out between the local union and the Navy because this procedure did not include representatives of the international union. Fifteen workers in the rim plant who participated in a work stoppage on July 11 were suspended and five were discharged by Captain Clark. It appeared likely that since the NWLB had ruled that the standard company-union grievance procedure under the old contract would result in grievances not settled between the Navy and the local union being referred to the NWLB and since the War Labor Disputes Act does not authorize appeals to the NWLB on grievances during government operation, an impartial umpire would have to be selected to relieve the Navy of this problem during its period of control.

It was reported from Akron on July 22 that the Goodyear company and the URWA would resume contract negotiations on July 23. Issues which led to the strike will be handled by an impartial umpire to be appointed in accordance with a NWLB directive.

The Firestone local union asked the NWLB to postpone for a week the NWLB August 8 hearing on Firestone grievances. Mr. Watson, local union president reported that such progress was being made in the negotiations between the Firestone company and his local that in the additional time a satisfactory agreement might be reached and the scheduled NWLB hearing might not be necessary.

J. P. Seiberling's Comments

In a talk before the Akron Rotary Club on July 10, J. P. Seiberling, president of the Seiberling Rubber Co., in discussing the future of Akron suggested that the leadership of the city—finance, labor, management, cultural, religious, and other groups—meet together and give guidance "so that Akron will be and remain a stable community."

"There can be no growth in a community that is at war with itself. No community that is divided can exist," he said. "I say something is wrong when a small group can chase thousands away from work in wartime. That sort of thing has to be stopped.

"I am not a union-baiter or a union-hater. I say that unions have done a lot for industry, too, believe it or not. The point is not unionism, but the abuse of unionism. To the credit of the international officers of the rubber union and the CIO, they are beginning to see it. But what can they do if they are not supported?

"The rubber industry today stands on the threshold of another great era of expansion. The industry was forced to develop synthetic rubber to replace natural rubber. I am not one of those who believe that synthetic rubber will replace the natural product, but I believe it will open up a new development.

"For instance, who ever thought the rubber industry would be interested in plastics?"

URWA Detroit Work Stoppage

On July 16 a controversy between the URWA local union at the Detroit, Mich. plant of the United States Rubber Co., the Mechanics Educational Society of America, and the National War Labor Board resulted in a work stoppage involving 4,000 workers at this plant. There was no management-labor difficulty at this plant; the cause of the controversy was the attempt of the MESA to force the NLRB to approve a new election to decide whether the URWA or the MESA should be the union representing the majority of the workers at this plant. When this request for a new elec-

tion which was made some time ago was denied 12 workers at the plant tried to establish a picket line and succeeded in inducing many of the workers to join them and absent themselves from their jobs.

The 12 workers who were also members of the URWA were expelled from this union on the general charge of "disruption" and in accordance with the maintenance of membership clause in the URWA contract with the United States Rubber, they were discharged by the company. When they still continued to picket the plant, the company obtained an injunction restraining the workers from picketing, and on July 24 about 10% of the 4,000 workers were reporting for work daily, and it was expected that the remainder would return before the end of the week.

Government Seizes Butadiene Plant

It was necessary for President Truman to issue an executive order on July 19 directing Petroleum Administrator for War Harold L. Ickes to take possession of the butadiene plant operated by Sinclair Rubber. Inc., at Houston, Tex., because of labor disturbances at this plant. The executive order was signed in Potsdam.

This is an RFC plant leased by Sinclair Rubber. The plant includes certain power, water, and other auxiliary facilities used to service the adjacent government-owned copolymer plant which is operated by the Goodyear Synthetic Rubber Corp. The design capacity of the butadiene plant is 50,000 tons a year, and it is currently being operated at a rate in excess of that capacity.

Rubber Reserve Co. 1940-1945 Program Report

On July 2 the Rubber Reserve Co. issued an 87-page study entitled, "Report on the Rubber Program 1940-1945," which reviewed the program of the company, a subsidiary of the Reconstruction Finance Corp., in the synthetic and natural rubber producing industries.

In making the report public, S. T. Crossland, executive vice president, said that the synthetic rubber production for 1944, 737,000 tons, was greatly in excess of the largest amount of natural rubber consumed in the United States in any year prior to this war. He added that the scheduled production of synthetic rubber for 1946—1,200,000 tons—is larger than the amount of natural rubber consumed in any one year by the entire world before 1941.

Statistics presented in the report cover the activities of the Rubber Reserve until the beginning of 1945, but Mr. Crossland disclosed that the 51 government-owned plants, whose operations are supervised by Rubber Reserve, produced 378,000 tons in the first five months of this year. The estimated production of 78,000 tons for June will make the total for the first half of this year about 456,000 tons. The scheduled production for the entire year is approximately 1,000,000 tons.

The report says that in 1944 it cost approximately 31¢ a pound to produce GR-S. That cost was the average for all plants in the program, exclusive of plant amortization and interest charges, program administrative and sales expense. The present operating cost at the lowest-cost plant is about 11¢ a pound. It was predicted that in the postwar era a production cost below that rate can be anticipated.

Regarding the quality of rubber, the report says: "Performance of tires made from synthetic rubber is now very close to that of the average prewar natural rubber tire. . . . The use of Butyl rubber in the manufacture of inner tubes where pneumatic (air retention) properties are important has been successful and is expanding."

Natural Rubber

The report also discusses the problems of acquiring natural rubber and the program initiated by Rubber Reserve for that purpose, which was subsequently transferred to Rubber Development Corp. The report describes by graphs the conversion of the rubber manufacturing industry from the use of natural to synthetic rubber, but it warns that natural rubber is still in short supply and that the United Nations stockpile is critically low.

"Pending the liberation of the occupied rubber producing areas and during the time required to bring the plantations up to a substantial percentage of their former capacity, it is anticipated it will be necessary for the U. S. Government synthetic rubber plants to operate at a high rate of capacity.

"The results of continuing developments with respect to the utility and cost of synthetic rubber, and the relationship between supply and demand for world needs, will largely govern the future of the industry and the ultimate destination of the government's program after the complete rehabilitation of natural rubber production in the Far East."

Schedule 1, below, presents significant natural rubber statistics. Schedule 2 shows the total quantities of natural rubber and liquid latex purchased, received, and sold by Rubber Reserve from the beginning of the crude rubber program in 1940 to January 27, 1945. It will be observed that of a net total of 964,616 long tons of rubber purchased by Rubber Reserve, only 24,753 long tons were lost as a result of enemy action. It will be further observed that 539,177 tons have been delivered since "Pearl Harbor," which figure includes the substantial tonnage obtained by the United States from Ceylon production under control of Great Britain.

Except for certain block purchases of crude rubber from French Indo-China, which were made directly by Rubber Reserve at the outset of the crude rubber purchasing program in July, 1940, all Rubber Reserve purchases of crude rubber were made through a buying committee comprised of a chairman and five members who were the rubber purchasing agents for five of the leading rubber manufacturing companies. This buying committee served under the supervision of Rubber Reserve without compensation. Although established as a temporary organization the buying committee's operations were of such nature that Rubber Reserve continued to use its services during the entire crude rubber program. The buying committee kept in daily contact with the principal rubber markets of the world and made all purchases in accordance with policies established from time to time by Rubber Reserve Co.

Beginning in June, 1941, Rubber Reserve became the sole importer of crude rubber for the entire country and likewise became the sole distributer of crude rubber to the rubber manufacturing industry. This central distribution system under Rubber Reserve Co. administration has continued to the present date and has been implemented by rubber consumption regulations issued by WPB, the report states.

SCHEDULE 2. RUBBER RESERVE COMPANY
NATURAL RUBBER ACTIVITIES

Natural Rubber	Long Tons	Long Tons
Total Purchases	1,040,521	
Cancellations	75,905	
Net Purchases		964,616
Less:		
Shrinkage in transit	3,389	
Losses by enemy action	24,753	
Afloat	9,794	
Unshipped	1,445	39,381
Deliveries		925,235
Sales	832,295*	
Fire Losses	6,054	
Shrinkage in storage	5,849	
Stockpile	81,037	925,235
Deliveries since Pearl Harbor		539,177
Liquid Latex	**Lbs.**	**Lbs.**
Purchases		52,740,516
Sales	46,456,248	
Losses by Enemy Action	1,852,584	
Unshipped	84,081	
Stockpile	4,347,603	52,740,516

* Includes 10,006 tons salvaged from fires.
As of January 27, 1945.

SCHEDULE 1. NATURAL RUBBER STATISTICS

Year	Basic Export Quotas of Producing Areas of Far East	Permissible Exportable Rubber % of Basic Quota	Annual Far Eastern Exports	Annual Exports from Areas Other than the Far East	Total U.S.A. Crude Rubber Imports Net‡	Total U.S.A. Crude Rubber Usage	Total Crude Rubber Stocks	Price of Crude Rubber at New York
	Long Tons*	%*	Long Tons*	Long Tons*	Long Tons*	Long Tons*	Long Tons*	¢/lb.*
1931	......	....	783,400	16,600	476,200	355,200	322,000	6.1
1932	......	....	699,400	8,300	393,800	336,700	379,000	3.4
1933	......	....	839,900	13,500	398,400	412,400	368,000	5.9
1934	996,500	87.1	1,004,700	14,400	439,200	462,500	361,000	12.9
1935	1,118,500	67.5	853,400	20,300	455,700	491,500	312,000	12.3
1936	1,254,000	62.5	832,000	25,900	475,500	575,000	223,000	16.4
1937	1,298,500	83.8	1,107,100	32,100	592,500	543,600	262,200	19.3
1938	1,335,250	55.0	862,900	32,000	406,300	437,000	231,500	14.6
1939	1,519,000	58.8	968,500	35,900	486,348	592,000	125,800	17.5
1940	1,541,550	83.8	1,348,395	41,300	811,564	648,500	288,864	19.9
1941	1,554,700	105.0	1,110,792†	33,548†	1,023,631¶	775,000¶	533,344¶	22.5
1942	1,563,000	....	......	......	271,797¶	376,791¶	422,714¶	22.5
1943	1,569,000	....	......	......	34,514¶	317,634¶	139,594¶	22.5
1944	......	....	......	......	98,169¶	144,113¶	93,650¶	22.5

* All information is from the October, 1941, "Statistical Bulletin of the International Rubber Regulation Committee" unless otherwise noted.
† First nine months only.
¶ Information from W. P. B.
‡ Re-exports from U. S. A.: 1941—5,376; 1942—10,856; 1943—20,815; 1944—9,665.

Review of Operations—Synthetic Rubber

Under the above heading, many details, some old and some new, on the operation of the synthetic rubber plants are given. For the entire year 1944 the butadiene from alcohol plants as a group operated at 164% of their rated capacity, and during August,

1944, the plants operated at 188% of rating, with the outstanding production performance being made at the Institute, W. Va., plant operated by Carbide & Carbon Chemicals Corp., which during this month produced 14,258 tons of butadiene, which represents 213% of rating.

The plants producing butadiene from petroleum feedstocks utilize several different processes and combinations of processes, and the performance of the plants has varied, it was said. Most of these plants have operated at or above their rated capacities, the 14 plants of this type produced at a rate of 90% of their total rated capacities during January, 1945.

An average over-capacity of approximately 50% was reported for the ethylbenzene portion of the plants producing styrene. The finishing sections of the plants have not yet operated at the same high rate of capacity, but with relatively small additions, including in some cases additional steam and cooling water facilities, it is expected that an average over-capacity of 50% will be attained.

Most of the copolymer plants have demonstrated their ability to operate at 120 to 130% of rating, the report states. A portion of the copolymer plant located at Louisville, Ky., and operated by The B. F. Goodrich Co., was altered in the Spring of 1944 to permit the production of GR-A, a butadiene-acrylonitrile rubber. During four months of 1944 a total of 2,060 long tons of this rubber was produced, and the converted unit is now equipped to produce either GR-S or GR-A, and the respective annual rated capacities are estimated to be 22,500 and 15,000 tons.

Reference is also made to the installation of facilities for the incorporation of carbon black, zinc oxide, and other materials into synthetic rubber while it is still in the form of latex. Such facilities have been installed at the Baytown, Tex., plant, operated by General Tire & Rubber Co. and at the Akron, O., plant, operated by the Firestone Tire & Rubber Co., and other installations are under consideration, it was revealed.

A 15,000 ton unit, comprising a portion of the plant located at Houston, Tex., and operated by the Goodyear Synthetic Rubber Corp., was converted to continuous polymerization in the Spring of 1944, and units with rated capacities of 45,000 long tons are in the process of conversion, and the conversion of other such units is under consideration.

The three plants located at Naugatuck, Conn., Akron, O., and Los Angeles, Calif., equipped to handle and ship synthetic rubber latex as a finished product have a latex shipping capacity of about 12,000 long tons a year on the rubber content basis. This capacity will be doubled in 1945.

The production problems with Butyl rubber, GR-I, are reviewed, and it is reported that recent operation of the Butyl plants has been most encouraging, and operating rates very close to design are now being experienced.

Other sections of the report discuss the financial problems of plant ownership, operating agreements, prices and costs. Much pertinent statistical data are included in 20 different tables, and copies of agreements pertaining to the manufacture of synthetic rubber conclude the report.

Converse Rubber Co., Malden, Mass., has moved its Chicago, Ill., branch to new and larger quarters at 564 W. Munroe St.

OPA Changes Price and Rationing Orders

Manufacturers are given an increase of approximately 20% in their ceilings for sales to bicycle manufacturers of the principal size of synthetic rubber bicycle tire assemblies, under Amendment 9 to MPR 435—New Bicycle Tires and Tubes—effective July 5. This increase must be absorbed by the bicycle manufacturers, for bicycle prices are frozen at March, 1942 levels, most of them in specific dollar-and-cent terms. The increase amounts to 55¢ for each assembly, consisting of two tires, two tubes and two rim strips, size 26 by 2.125. This size represents approximately 80% of the total production of bicycle tire assemblies.

OPA said the increase was mandatory under the Price Control Act. A study of production costs, undertaken at the request of the three manufacturers now engaged in producing these assemblies, showed that the higher ceilings are necessary to enable them to cover their average factory costs.

OPA pointed out that a slightly larger increase previously had been granted on sales of bicycle tires and tubes in the replacement trade, but that no increase had been allowed before in the ceilings of tire and tube assemblies sold to bicycle manufacturers for use as original equipment.

On other sizes and types of assemblies, manufacturers will continue to use their highest March, 1942, prices as the ceilings.

Order 69 to SO 94, effective July 12, establishes dollar-and-cent ceilings for sales by the Department of Commerce's Office of Surplus Property of 10,857 used airplane tires declared surplus by the Army Air Forces. The tires are at Army depots in Mogadore, O., and Ontario, Calif. These tires, while no longer considered safe for use on Army planes, can be converted for use on such ground types of vehicles as farm implements and other farm equipment. Heretofore tires of this kind have been sold by the Army Air Forces as scrap. However, since they have been found to be suitable for use on various farm vehicles, the Army Air Forces has declared them surplus and turned them over to the Department of Commerce for disposal in civilian channels. The Department of Commerce will not sell the tires to individual farmers or other consumers, but will make sales only to in-the-trade distributers.

Service stations and other tire repair shops prevented from making additional charges for extra services connected with tube repair jobs only, may now apply for permission to make additional charges, according to Amendment 2 to RMPR 528—Tires and Tubes, Recapping and Repairing, and Certain Repair Materials—effective June 30. This action applies to such services as pick-up and delivery, mounting and demounting of tire and tube from wheel, and road service for emergency repair jobs involving tube repairs. Amendment 2 also adds dollar-and-cent retail ceilings for several new sizes of used tires, basic tire carcasses, recapping and repairing services, and for repair materials. A number of specific ceilings for used airplane tires also have been revised.

Several new orders have been added to RMPR 528, setting maximum retail prices for the new tires indicated: No. 45, 36x14 solid truck tire made by United States Rubber Co., New York, N. Y.; Order 46, 21.00-24, 24-ply Universal cotton truck and bus tire, B. F. Goodrich Co., Akron, O.; No. 47, three Hard Rock Lug truck, a 7.50-15 trailer, and a 7.50-16 all-traction rear tractor (for golf course and industrial tractors) tire, Goodyear Tire & Rubber Co., Akron; No. 48, one passenger car, one truck and bus, one mud and snow, one farm tractor front and two truck tires, Firestone Tire & Rubber Co., Akron.

As a further step in revising its rationing regulations to assist returning veterans wishing to open small businesses, OPA by Amendment 100 to RO 1A—Tires, Tubes, Recapping and Camelback—effective July 6, makes it possible for veterans of the present war to become tire dealers on a small scale. Because of the acute shortage of tires, OPA for the last year has not given permission to anyone not already in the tire business to get certificates for truck or passenger tires. In keeping with the government's program to aid returning veterans, OPA is now relaxing this regulation to allow veterans to obtain stocks of tires. With total tire supplies still critically short, the stocks allowed the veteran necessarily must be small, and OPA recognizes that they would be insufficient to provide satisfactory incomes from their sale alone. It is felt, however, that even a small stock will be a valuable adjunct to the veteran entering an allied automotive business such as the sale of gasoline, the maintenance of a garage, or the recapping and repairing of tires.

Should the veteran establish himself in such business, OPA will give him certificates to buy a stock of ten passenger tires, four small and two large truck tires, and six tractor-implement tires. As the tires are sold, the veteran may replenish his stock by sending the certificates to his supplier for replacements. Under the new arrangement a veteran may, during his first year as a dealer, dispose of his dealer inventory in two ways. He may return his inventory to his supplier; or he may transfer it to another veteran who has established his eligibility for an allotment. Both require OPA district office authorization. In addition OPA explained that a veteran who goes into the business must be engaged principally in operating his own establishment and be the principal owner. If this status should change during the first year after his allotment was authorized, he must surrender to his OPA district office replenishment portions representing the tires received as an allotment.

Amendment 101 makes eligible, beginning July 16, for Grade I passenger-tire purchase certificates, subject to quota and other restrictions, passenger-car owners using their automobiles for a bona fide change of residence for which they were issued special gasoline rations. The amendment also makes it possible for a small number of passenger-car owners to obtain purchase certificates for truck tires for use on their automobiles. Thus truck tire certificates may be obtained for passenger cars operating on B or C rations if a suitable passenger tire is not available or if a passenger tire cannot be used on the automobile. The amendment, moreover, prohibits dealers from obtaining certificates for mounting new tires on used 1942 passenger cars being held for sale; dealers will also be prohibited from obtaining new tires for the few new 1942 cars still held for sales as they are equipped with their original tires.

Tire distributers who perform the distributing function of a "factory branch," even though dealer owned, may be granted additional tire certificates under certain conditions, according to Amendment 102, effective July 28.

Amendment 3 to Rev. RO 1C—Tire Ra-

tioning Regulations for the Virgin Islands —revokes Section 8.2 (b).

August quotas of 2,500,000 passenger-car tires and 386,862 small truck tires for civilian motorists were exactly the same as for July, but the quota of truck tires 8.25 and larger was cut from 234,308 for last month to 200,000 for this month. Quotas for tractor-implement tires also were reduced: size 7.50 or smaller, 60,000 in August, against 70,000 in July; larger than 7.50, 35,000 against 40,000.

Amendment 6 to MPR 420 establishes ceilings for specified finished heels with a leather or a rubber top lift.

Order 3, MPR 200, sets the manufacturer's, wholesalers', and shoe repairmen's ceilings for sales in the shoe repair trade of the following commodities of The Holtite Mfg. Co., Inc., Baltimore 30, Md.; women's standard and competitive black composition rubber whole heels bearing the brand names "Commander," "Holtite and Jax"; men's black neoprene oilproof half heels and men's black 12 iron neoprene oilproof half soles, both of the brand "Commander."

Order 5 to MPR 132 authorizes maximum prices for sales at all levels of the neoprene dipped footwear item bearing the brand name "Shower Toes" and made by Perry Rubber Co., Massillon, O.

Order 57 under 3 (e), GMPR, establishes maximum prices for sales in the shoe repair trade by the manufacturer and by wholesalers of molded half-soles and toplift strips, all bearing the trade name Neolite and made by The Goodyear Tire & Rubber Co., Akron, O.

Order 64 under 3 (e) establishes ceilings for all sales of the black and the brown plastic non-marking thin heels bearing the trade name O'Sullivan Aristocrat and of the black, brown, and leather-colored plastic non-marking thin heels of the brand O'Sullivan, all made by O'Sullivan Rubber Co., Winchester, Va.

Rev. Order 62 (July 20) to SO 94 establishes maximum prices at which specified new and used Navy life belts may be sold by the United States Department of Commerce or by any other government agency, and by any subsequent reseller.

Region I Order G-3 under Supp. Order 94 establishes ceilings for used United States Navy Department impregnated bedding bags.

Several more orders have been added to MPR 220. Amendment 1 to Order 105 authorizes maximum prices for baby pants and bathing caps, both of six-gage vinyl resin film, and products of M. L. Harvey Co., New York, N. Y. Ceilings on the following bathing caps are covered in Orders 110-112: #60, of olive drab vinyl resin film, The White Products Co., New York; #900 Aviatrix All American vinyl plastic cap and #950 Aviatrix All American opaque plastic shower cap, Aviatrix Co., New York; and cap made of 0.006-gage plastic vinylite sheeting by Parker, Stearns & Co., Inc., Brooklyn, N. Y. Order 113 relates to maximum prices for S2684 Bestik cement manufactured by B. B. Chemical Co., Cambridge, Mass.

Order 146, MPR 478, covers ceilings for six styles of pyroxylin coated fabrics converted by Fabrico Products, Haverhill, Mass. Orders 147 and 148 relate to ceilings for specified vinyl resin coated fabrics of Hood Rubber Co., Watertown, Mass.; while Order 149 does likewise for pyroxylin coated sheeting of Plymouth Rubber Co., Inc., Canton, Mass.

Order 61 under 3 (e), GMPR, sets ceilings for sales of a 6¾-ounce size of the following wax products of S. C. Johnson & Son, Inc., Racine, Wis.: paste wax, liquid wax, Glo-Coat, Car-Nu and black rubber dressing.

Order 62 applies to maximum prices for all sales of portable bath tubs manufactured by Soldine Corp., Evanston, Ill., from butyrl vinyl resin coating material.

Order 51, MPR 149, authorizes maximum prices for certain straight automotive radiator hose produced by Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J.

Order 4049, MPR 188, sets maximum net prices for No. 2222 black rubber sink stopper manufactured by Empire Toy & Mfg. Co., Chicago, Ill.

Order 14, RMPR 300, sets ceilings for two sizes of balata air mattresses and one size of air pillow, manufactured by K. & W. Rubber Corp., Delaware, O.

Amendment 1, Order 25, MPR 580, establishes ceilings at retail for Hickory girdles and Paris belts, products of A. Stein & Co.

To Save More Natural Rubber

No more tires will be manufactured entirely of natural rubber, W. James Sears, deputy director of the WPB Rubber Bureau, reported July 5 as additional steps to conserve America's dwindling stockpile of natural rubber were announced.

Use of synthetic rubber in the manufacture of all truck tires and bogie wheel tires for tanks is specified in Amendment 1 to Appendix II of Rubber Order R-1, effective July 5. The appendix includes a chart giving the construction authorized for all tires except airplane and bicycle tires. The amendment affects certain sizes of truck, bus, and implement (off the road) tires and bogie, idler, and support-roller tires for tanks and half-tracs.

"Every pound of natural rubber must be reserved for products that cannot be made of adequate quality by using synthetic rubber," Mr. Sears said. "Because the rubber manufacturing industry has already been largely converted to synthetic rubber, additional conversions are necessarily small, but they will continue to be made whenever possible."

The amendment is expected to save 1,300 long tons of natural rubber a year, Mr. Sears said.

All pneumatic tires, he explained, now fall into one of the following classifications, arranged in order of percentage of synthetic rubber:

Construction	Synthetic Rubber	Natural Rubber
S-3	100% (except cement)	
S-4	90%	10%
S-5 (Synthetic tread on natural rubber carcass)	35%*	65%*
S-6	70%	30%
S-7 (Similar to S-5 except that the various types of rubber may be used as desired)	35%	65%
S-8	93%	7%
S-9	80%	20%
S-10	50%	50%
S-11 (Synthetic sidewalls)	5%*	95%*

* Approximate.

Aqueous dispersions of reclaimed rubber are no longer under allocation because they are in more plentiful supply. The various sections of R-1 that dealt with their allocation are removed by Amendment 1. Aqueous dispersions of reclaimed rubber may now be used for any purpose permitted by Appendix 1 of R-1.

Amendment 1 to Appendix 1 of R-1, also announced July 4, corrects various technical and typographical errors which appeared in the printed order as amended May 30. None of the corrections substantially affect manufacturers of rubber products, the WPB Rubber Bureau said.

Amendment 2 to Appendix II of R-1 makes more GR-I synthetic rubber (Butyl) available for inner tubes for large tires. Because of increased production of GR-I it is possible to sanction its use in inner tubes for all pneumatic industrial equipment and tractors and implements except in the small sizes, 5.50-16, 6.00-16, and 6.50-16. The use of Butyl for inner tubes will be extended further whenever the supply permits.

To conserve natural rubber, synthetic rubber will be more widely used in airplane tires, according to Amendment 3 to Appendix II. At a time when every pound of natural rubber must be conserved, the revisions contained in this amendment, together with changes made in List 12 of the same appendix May 30, will provide a saving of 125 long tons of natural rubber a year, based on present production schedules, according to the Rubber Bureau. The improved supply position of carbon black has made it possible to lift restrictions on the manufacture of Grade A camelback for use in recapping passenger-car and small truck tires, the Rubber Bureau also announced July 14. Grade A, or top quality, camelback had been restricted to crown widths of greater than 5½ inches. Amendment 4, which revises List 13 of the appendix, permits its manufacture in all sizes.

To conserve further the nation's stockpile of natural rubber, WPB announced July 23 that rayon tire cord will now be used in the production of five smaller sizes of truck tires for which only cotton tire cord had previously been authorized. This action was made possible partly by increased production of rayon tire cord and partly by reduced requirements for military tires. The tire sizes affected are 7.50 six- and eight-ply, all rim diameters, highway tread.

The use of high-tenacity rayon tire cord permits a percentage reduction of the natural rubber presently allowed in making these smaller sizes of truck tires, according to Mr. Sears, who also said that the synthetic construction of 7.50-16 eight-ply highway tires has been changed from S-6 which permitted the use of 30% natural rubber and 70% GR-S to S-4, the construction in which only 10% of natural rubber may be used. By this change a saving of 350 long tons of natural rubber a year is expected on the basis of present tire production schedules.

Highlighting the savings involved, Mr. Sears gave the following example: "In the 7.50-16 eight-ply highway tire, 7.4 pounds natural rubber has been allowed. However, with the use of rayon tire cord, only 3.2 pounds will now be necessary and permitted."

The changes are made effective by Amendments 5 and 6 to Appendix II.

Rubber-coated canton flannel work gloves may be sold by manufacturers and processors, on and after July 7, 1945, only to fill orders bearing preference ratings, according to Direction 2 to Order M-375, issued June 30. It is intended to insure distribution of rubber-coated gloves to essential users, such as chemical workers, electricians, and others who need these gloves for protection against acids, abrasives, and similar hazards. The direction applies to

all types of band top, gauntlet style, or knitwrist canton flannel work gloves that have been immersed, sprayed, or coated with rubber, reclaimed rubber, or synthetic rubber.

General Limitation Order L-143-a as Amended July 5, 1945, redefines rubber processing machinery or equipment; requires use of Form WPB-1319 for applications for a preference rating; and limits authorization for purchase of rubber processing machinery and equipment to a 45-day period because some manufacturers obtained priority and then failed to place the orders.

A revised list of critical products and materials was submitted to WPB on July 10 by the Joint Committee on Critical Materials and Products. Among the items listed are: antimony, asbestos textiles, conveyer belting, benzene, cadmium, cotton broad woven fabrics, cotton linters, cotton sales yarn and narrow woven fabrics, cotton rubber-lined fire hose, gasoline dispensing hose, high-pressure wire-braided hydraulic hose, suction hose four-inch and larger, iron oxide (yellow precipitate), laboratory equipment, lead, rubber processing and tire making machinery, textile machinery, naphthalene, naphthenic acid, neoprene, nylon, phthalic anhydride, natural rubber and latex, scrap rubber, D. R. waterproof tape, tire cord, pneumatic truck tires and tubes, and wax.

Because of sufficient supply of imported cane alcohol Order L-348 has been revoked.

The following orders have been revoked and their respective products made subject to M-300: Allocation Order M-190—Calcium Carbide; General Preference Order M-307—Casein.

Limitation Order L-201 was revoked July 3, and the manufacture and delivery of automotive tire chains, tractor tire chains, and chain parts now are subject to Limitation Order L-302, as Amended July 3, 1945—Chain.

Interstate Commerce Commission, Washington, D. C., at a meeting of Division 3 on June 29 made some changes in its regulations on the transportation of explosives and other dangerous articles, including one that now sets the maximum quantity of rubber cement expressed at 15 gallons.

Foreign Economic Administration, Washington, D. C., in "Current Export Bulletin No. 255," July 2, treats of the restoration of private trade to French North Africa and states that license applications for that area will be considered immediately for any of the commodities listed in the bulletin, including: hard rubber battery boxes; camelback; automobile, bicycle, motorcycle, truck, and bus casings and tubes; automotive fan belts; hard rubber goods including electrical goods; hose and tubing; latex; rubber and friction tape; rubber and balata belting including rubberized carrier belts; rubber boots, shoes, gloves, and mittens; rubber and rubberized clothing; rubber erasers; rubber packing; rubber thread; other rubber manufactures; tire repair material; automobile, truck, and other solid tires; greaseproof and waterproof paper; abrasive wheels; asbestos manufactures; mineral wax, except paraffin; talc; chains; automobile accessories; insulating materials; valves; calcined magnesia; combs; molded products of phenol of formaldehyde; synthetic resin products.

EASTERN AND SOUTHERN

A. F. Sozio

Walter E. Scheer

Amecco Chemicals, Inc., manufacturer of synthetic organic chemicals, Rochester, N. Y., has elected Walter E. Scheer vice president and a director. Mr. Scheer, general manager of the company for the past several years, will continue to make his headquarters at the firm's New York, N. Y., office at 60 E. 42nd St.

Hewitt Advances Several

To provide greater efficiency in the engineering and production of war products and to increase the postwar volume of civilian products, Hewitt Rubber Corp., Buffalo, N. Y., has effected several changes within its organization.

Vice President Lester D. Bigelow has moved to Chicago to supervise Midwest sales, the same position he occupied before the war. Since then he has been in charge of manufacturing. Mr. Bigelow, with Hewitt since 1932, has been an officer of the company for six years.

Frank W. Blanchard has been promoted from chief engineer to factory manager in charge of all production in both Buffalo plants. He joined the company nine years ago and did much of the development work on bullet-sealing tanks for fighter planes. On this tank program he invented several methods of manufacture which were adopted throughout the industry. Clayton H. Skinner has been advanced from plant engineer to chief engineer.

T. C. Zinter, Hewitt technician since 1919, has been made manager of belt sales and development; while Harold C. Patterson, former assistant sales manager, has been named manager of hose sales and development.

R. G. Mack, formerly with the Sponge Aire Seat Co., Buffalo, has joined Hewitt's latex foam product division. Stewart Ogilby, former technician of General Cable Co., New York, N. Y., has been assigned to chemical research on latex foam product development at the Buffalo main plant. Charles F. Munroe has entered the eastern sales division in New York. Larry Burmester, formerly with Gates Rubber Co., Denver, Colo., has been added to the Pacific Coast division in San Francisco. Frank B. Speaker, who served as a WPB engineer in Washington, has been assigned to the field engineering staff.

A. A. (Fred) Beaulieu, of Cambridge, Mass., has been named a district manager of hose and belt sales in the eastern central states, and James Doyle has joined the sales staff in the Boston area.

New equipment being added at Hewitt will increase production capacity 50%. F. W. Blanchard, factory manager, stated that the mixing efficiency of the plant will be increased by this addition, and rubber compounding operations will be improved. The equipment is comprised of a No. 11 Banbury mixer, 120-foot stock cooling conveyers with helical stock cutters, and new conveyer equipment to move rubber compounds into the mixer. Building alterations necessary include construction of conveyer houses. A special printing machine for identifying rubber stocks is an unusual feature of the new conveyer system.

Working conditions are being improved by installation of a large exhaust system which will remove 15,000 cubic feet of air per minute. A complete change of air every 20 minutes will be provided.

Berman on Postwar Rubber

Michael Berman, of Hewitt Rubber, recently returned from Mexico, stated that although synthetic rubber is here to stay, British and Dutch interests are eager to regain the war-lost markets here for natural rubber and are talking of delivering it to New York for 12 to 15¢ a pound after the war to compete with synthetic rubber. These interests plan to spend $1,000,000 a year in advertising descriptions of new uses for natural rubber and reasons why the product is, supposedly or actually, superior to synthetic rubber, it was added. Before the war the price of crude rubber was approximately 17¢. Mr. Berman added that, given five years, we will have a product "equal to natural rubber and superior in many respects." Because of production efficiency, synthetic rubber prices to rubber companies may come down to 12-15¢ a pound, he stated.

Mr. Berman was in Mexico analyzing the chemical problem of Fabrica de Artefactos de Hule Eureka S.A., manufacturer of mechanical rubber products which recently entered into a working agreement with Hewitt.

Society of Plastic Industry, 295 Madison Ave., New York, N. Y., has announced that Albert Pfaltz, who has resigned as director of public relations, has been succeeded by Barrett L. Crandall, a graduate of Cornell University, who has been associated with business leaders engaged in postwar planning for industry. Previously, he was doing public relations and advisory work, serving private organizations and trade groups.

Norman Bekkedahl, research chemist at the National Bureau of Standards, whose article on "Rubber Research in Tropical Brazil" was published in the July issue of INDIA RUBBER WORLD, has returned to Brazil for a two-month period at the request of the Brazilian Government to aid in the further development of that country's research and rubber testing evaluation program. Dr. Bekkedahl is expected to return to the United States in September.

Calco Chemical Division of American Cyanamid Co., Bound Brook, N. J., on June 23 purchased at public auction the Gloucester City, N. J., plant of the Sherwin-Williams Co., used for experimental production of titanium dioxide. As these experiments were recently completed, Sherwin-Williams sold the plant. While no final decision has been made as yet by Calco, it is probable that a program will be started to make certain changes in the process that will result in the production of titanium dioxide, utilizing information and experience gained at its factory in Piney River, Va. Ames Hettrick, manager of the Piney River plant, will also be manager of the new plant.

Chamberlin Rubber Co., 94 Clinton Ave. North, Rochester, N. Y., has taken a ten-year lease on the building at 186 Clinton Ave. North and as soon as alterations are complete will occupy it, about September 1. The company, established in the early 1860's by James R. Chamberlin, has been identified as distributer for Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J., for as long as Manhattan has been in business. The present head of the Rochester firm, Major James B. Little, in the Armed Forces for the past three years, is a great-great-grandson of the founder. Oren A. Ferster is secretary of the concern.

Houdry Process Corp., Philadelphia, Pa., has named Gordon A. Kessler head of the patent division and John E. Ford, Jr., executive assistant of the corporation. Mr. Ford joins Houdry after eight years with M. W. Kellogg Co.; during 1941 and 1942 he was the project engineer on the synthetic rubber plant constructed at Sarnia, Ont., Canada. A graduate of the Georgia School of Technology, Mr. Ford gained his early experience with the Sinclair Refining Co. at Houston, Tex. For several years Mr. Kessler was patent attorney with the Texas Co. and before that with Allied Chemical & Dye Corp. He had also previously served as an examiner in the United States Patent Office.

Continuing its expansion program, Houdry Process recently opened offices at 115 Broadway, New York, N. Y., to be headquarters for the commercial development division, project analysis division, and foreign sales department under the direction of Robert B. Cragin, vice president in charge of commercial development.

The Houdry Laboratories at Marcus Hook, Pa., will operate under the research and service subsidiary, Houdry Process Corp. of Pennsylvania. Catalyst manufacturing plants are located at Paulsboro, N. J.

Westinghouse Electric Corp., East Pittsburgh, Pa., has made Andrew H. Heywood manager of its motor application department. He has been with the company since his graduation from Northeastern University in 1926.

Foster D. Snell, Inc., 305 Washington St., Brooklyn 1, N. Y., has announced that Miriam Lauren and Gerald M. Compeau have joined its staff. Mrs. Lauren, formerly of the Rockefeller Institute of Medical Research, will have charge of Snell's greatly enlarged micro-analytical laboratory; while Mr. Compeau, recently analytical chemist with Colgate-Palmolive-Peet Co., becomes assistant to the director of the analytical laboratory.

Frank M. Maly

The Baldwin Locomotive Works, Philadelphia, Pa., will open a headquarters in Paris in September to provide "on-the-spot" coverage for Baldwin's heavy machinery in France and its colonies, Belgium, and Holland. Named to direct the new office is Thomas Butts, who, after service in the French and American armies in World War I, from 1919 until 1925 installed and managed branch offices for the Chicago Pneumatic Tool Co. and its German and English subsidiaries in Rotterdam and Paris. Later he became trade commissioner at the American embassies in Paris, Berlin, and Brussels. In 1940 he joined the WPB and became chief of aircraft production analysis. From 1942 he served as head mission officer in the North African Economic Board at Algiers, handling engineering matters for Morocco, Algeria, and Tunisia. For a year prior to joining Baldwin, Mr. Butts was chief of the Metropolitan France Section of FEA at Washington, D. C.

Baldwin Locomotive, according to Robert Allen, general manager of the firm's Southwark Division, has appointed Frank M. Maly sales manager for plastic presses. Mr. Maly, veteran designer of industrial machinery, dies, and molds, will direct the company's activities as a supplier of postwar plastic and rubber molding machines. For three years prior to joining Baldwin, he had served the Philip Carey Mfg. Co. as assistant to the vice president in charge of manufacturing and later as plant manager of the firm's chemical section at Plymouth Meeting, Pa. A native of Chicago, Mr. Maly received his education and engineering training there and served numerous Chicago firms as a tool and machinery designer.

U. S. Rubber Changes

F. S. Carpenter, formerly factory manager of the Los Angeles synthetic rubber plant, operated for the government by United States Rubber Co., Rockefeller Center, New York, N. Y., is being transferred to the company's plantation division with headquarters in New York. He is succeeded at Los Angeles by Philip E. Rice, formerly factory manager of the Naugatuck, Conn., chemical plant. That position now goes to Donald L. McCollum, who has been production manager, chemical division.

Leland R. Replogle, for 22 years with Replogle Mill, Red Oak, Iowa, and safety director at the Des Moines Ordnance plant since 1942, has joined U. S. Rubber as field engineer for the safety department, with headquarters in New York.

To provide through strategically located branches a well-balanced sales and service coverage for distributers, Fisk tire division has opened three new district branches: Philadelphia, embracing eastern Pennsylvania, southern New Jersey, and part of Delaware, with John M. Bushey as district manager; Pittsburgh, covering western Pennsylvania, western extremity of New York, and parts of Ohio and West Virginia, with Max C. Welshimer as district manager; and Minneapolis, covering western Wisconsin, Minnesota, North and South Dakota, and nearly all of Iowa, headed by Fred G. Sargeant.

U. S. Rubber has developed a new method of neutralizing enemy bombs, perfected under the direction of the Ordnance Bomb Disposal Center at Aberdeen Proving Ground, and such vital military installations as power plants, water mains, ammunition and gasoline dumps have been saved from possible destruction. This process of neutralizing enemy bombs is still a secret.

"Unitension," a new technique, is being used in the manufacture of rotary hose; this method gives the hose increased strength and flexibility. A special machine, designed by U. S. Rubber engineers, winds the main pressure-resisting wires around the rubber and fabric carcass at a scientifically determined angle. The tension on each individual wire is controlled; therefore the tension on all wires in all plies throughout the hose is equalized, and placement of the wires is uniform. Tests have shown this hose to have greater strength and flexibility, and the improvement is being applied to the "Matchless" rotary hose for deep well oil drilling and the "Peerless" which is used for average pressures.

Jean N. LeBras, director of research of the French Rubber Growers' Institute, Paris, France, is visiting the United States to study progress in rubber technology and research and also in producing and manufacturing methods, for the French Government. M. LeBras is visiting various laboratories and plants throughout the country and expects to return to France about October 1. Not only was research carried out at the French Rubber Institute without any appreciable interference during the German occupation, but a new building and new research facilities were completed during that period. The Institute continued its training of young men for service on the rubber plantations in French Indo-China and is perpared to staff these plantations with these technicians just as soon as the area is liberated. M. LeBras stated that he was reasonably certain that an accumulated supply of natural rubber totaling about 200,000 tons would be found in this French possession.

United Carbon Co. has been gratified by the interest shown in its publication, "Developments and Status of Carbon Black" by I. Drogin, as evidenced by the number of requests the company has received for copies of the book. The company has announced that a few copies are still available for distribution and will be supplied in answer to requests made either to the main offices in Charleston, W. Va., or to the New York office at 350 Fifth Ave.

One of the "Half and Half" Tires Being Measured for Tread Wear by J. V. Hazen, Shell's Operations Supervisor for the New York Division.

New Shell Plasticizer Tested

A synthetic rubber tire has been undergoing thorough testing by the Shell Oil Co., New York, N. Y., in cooperation with General Tire & Rubber Co., Akron, O. However this is an unusual tire; one half of it is made of ordinary synthetic rubber, and the other half incorporates Shell Dutrex, a plasticizer and extender for GR-S. Dutrex, completely derived from petroleum, replaces a pound of the more expensive GR-S and gives softness and pliability to this elastomer. This product is by no means confined to uses for tires; Dutrex has already been used successfully in the manufacture of footwear and other rubber goods made of synthetics for military and naval uses.

Referring again to the use of Dutrex in tires, there are 212 of these specially built tires, such as the one mentioned previously, now being tested on Shell cars and trucks in all sections of the country; each one is recorded by number in Akron, New York, or Washington with its individual characteristics set down in minute detail together with the description of its particular assignment. There will be available to the engineers testing these tires complete data on performance characteristics of 12 combinations of Dutrex with regular synthetic rubber in passenger treads, five combinations in passenger carcass stocks, and four combinations in truck treads and carcass stocks.

Two half-treads are exactly fitted together on the circumference; the points of separation are marked for ready reference to performance values on the two halves, the one containing Dutrex, the other without this plasticizer. Without previous knowledge of which half is which, the driver takes five tread depth readings for each half, takes an average, and enters the averages on the tire record. The tires are removed as soon as either half of the tread has worn smooth, or as soon as failure occurs in either half which is not repairable.

The truck tires are mounted four to a vehicle on the drive wheels of seven heavy-duty trucks. Checks for breaks in the sidewalls will also be made.

The companies expect to solve many problems through the medium of this particular experiment. One problem being solved is the selection of the proper type of carbon black; this is important as synthetic tires have a tendency to heat faster, in operation, than natural rubber tires.

The OPA, recognizing the value of the experiment, has given its approval to this plan, and the results of the test will be made available to the Rubber Bureau of the WPB. Conforming with OPA requirements, each tire is assigned to a certain vehicle and covered by an affidavit bearing its serial number, driver's identification, vehicle identification, and site of operation.

When final results of the tests are in, they will be made public to the tire and rubber industry.

Ralph Horton, president of Miller Marine Decking, Inc., 230 Park Ave., New York, N. Y., has been elected president of Great American Industries, Inc., to succeed Harold W. Harwell, retired. Great American Industries, which has offices at 247 Park Ave., New York, and operates plants at Meriden, Conn., Elmira, N. Y., Bedford, Va., and Rutland, Vt., manufactures electrical and rubber products, trucks, and automotive equipment. Mr. Harwell president since January 1, 1943, will be available for consultation, it was said.

R. T. Vanderbilt Co., Inc., 230 Park Ave., New York, has announced the following additions to the staff of its research and development laboratory at East Norwalk, Conn. George G. Winspear, for the past 15 years a development engineer with the Bell Telephone Laboratories working on compounds for wire and cable use, will continue this type of work with the Vanderbilt company. Roger Spencer Sweet, formerly a research chemist with Heyden Chemical Corp., will devote his time to research on rubber and new compounding materials. Robert K. White, previously employed by the Vultex Chemical Co., Monsanto Chemical Co., and for the past five years by the Youngs Rubber Co., will do development work on latex and latex compounds at the Vanderbilt laboratory.

War Food Administration, Washington, D. C., has issued War Food Order 137, placing all supplies of castor oil under complete allocations control, effective July 1, 1945. Under the terms of the order, all users must obtain authorization from WFA to accept delivery of or to use castor oil, including any supplies now on hand. It was necessary to place controls over the supply of castor oil, WFA explained, to ensure its use in essential military and civilian products. Although supplies during the last year and a half have been adequate to meet these needs, the present castor bean crop is estimated as being susbtantially smaller than the previous two years' crops. The new allocation order is similar to the revoked WFO 32, which controlled the distribution and use of castor oil during the critical period from the Spring of 1943 to October, 1943. Users must apply for permission to accept delivery of and/or to use castor oil on Forms 477 and 478, obtained from the Fats and Oils Branch, Office of Marketing Services, WFA, Washington 25, D. C.

OHIO

Goodrich Personnel Promotions

The B. F. Goodrich Co., Akron, last month announced several changes among its executive personnel.

Two appointments have been made on Goodrich's research staff. T. L. Gresham has been named director of organic chemicals research. He had been director of Koroseal and plastic research since 1943. C. F. Gibbs has been appointed director of polymerization research. Dr. Gresham joined Goodrich in 1937. He was awarded his bachelor and master's degrees in chemistry by Emory University, and his doctor's degree at Johns Hopkins University. Dr. Gibbs, with the company since 1936, was granted his bachelor's degree at Knox College and his doctor's degree at the University of Illinois.

A. D. Eastman, formerly manager of office and technical personnel in the Goodrich salary personnel division, has been named director of personnel service for the company, succeeding C. V. Molesworth, resigned. Mr. Eastman came to Goodrich from Kenyon College in 1943 where he had been on the faculty and the administrative staff.

The following changes have been made in Goodrich's automotive, aviation and government sales divisions. Earl R. Kambrich, formerly in the Dayton office, has been transferred to the Los Angeles district as a sales representatives. His place in Dayton is being taken by John W. Oakes, a member of the organization's new products department with headquarters in Akron. R. L. Custer, an aviation industry representative in the Detroit district, has been transferred to industrial products sales.

Donald W. Fairbairn has been named manager of the Detroit district of the industrial products sales division, succeeding Ralph McPeake, Detroit district manager since 1938 who is retiring from business. Mr. McPeake is a veteran of the rubber industry, having been with his company since 1909, most of that time as an executive in industrial product sales.

A graduate of the United States Naval Academy at Annapolis, Mr. Fairbairn joined Goodrich in 1926. For 15 years he was a sales engineer in the Detroit district for industrial rubber products, specializing on automotive industry uses of rubber. He returns to Detroit from Los Angeles, Calif., where for the last two years he has been

manager of the sales district established by the company there in 1943. On his staff are Wallace J. Habermas, manager of the automotive section of the district's activities, and J. O. Trinkle, manager of the industrial section.

Wallace J. Habermas has been named manager of the automotive section of the Detroit district of the industrial products sales division. He has been with the company 32 years, all of that period in the Detroit district in automotive industrial products sales. He joined the Diamond Rubber Co., later merged with Goodrich, on April 15, 1913, and shortly afterward was made manager of automotive wire and cable sales in the Detroit district.

William F. Lowndes has been appointed managing director of Goodrich Svenska-Gummi A. B. with headquarters in Stockholm, Sweden. Mr. Lowndes comes to Goodrich with more than 15 years' experience in export work with one of the world's largest automobile manufacturers; the last seven years of this time were spent in Scandinavia. He is returning to Sweden to reestablish the company's international division's selling organization there in conjunction with Goodrich's Swedish manufacturing associates.

Edward M. Martin, international division of the Goodrich company, returned to France in July, resuming duties halted when German armies overran that country. Mr. Martin, who lived and worked in France for 10 years before the outbreak of war, has served the American government in several important assignments in Washington, D. C., during the war period. He returned to France in November, 1944, as a member of an Anglo-American mission there to make recommendations on the restoration of the rubber industry and the reestablishment of civilian transportation. During the early years of the war he was assistant treasurer of B. F. Goodrich before being called to Washington in 1943. A graduate of Harvard University, Mr. Martin was an artillery officer in Europe during World War I.

John L. Collyer, Goodrich president, has been named a member of the executive committee of the International Chamber of Commerce.

Harry E. Foster has been appointed treasurer of B. F. Goodrich Chemical Co., Cleveland. Mr. Foster, formerly general auditor, also becomes assistant secretary of The B. F. Goodrich Co. He joined the Goodrich company in 1917 and was first engaged in production work in Akron. In 1920 he was made staff manager at the company's chemical plant, a job he held until 1927. In the following years he was assigned to accounting, costs and budget work, and in 1942 was made staff superintendent of the newly formed chemical division. When that division was moved to Cleveland last year as a separate operating unit, Mr. Foster became general auditor. Under his new title Mr. Foster will continue to direct the production and sales accounting work for the company's main office in Cleveland, the Geon polyvinyl resins plants in Niagara Falls, N. Y., and Louisville, Ky., a chemical plant in Akron, and three government owned synthetic rubber plants which the company operates in Port Neches and Borger, Tex., and Louisville, Ky.

A new division of activity for the promotion and sale of thermosetting resins has been created by the Goodrich Chemical company, and Sam L. Brous appointed sales manager. He had previously been manager of technical service. In his new capacity, Mr. Brous will direct the commercial development and sales of new thermosetting plastic materials now in the experimental stage. With The B. F. Goodrich Co., since 1929, Mr. Brous started with the chemical research staff and was one of the trio who developed plasticized polyvinyl chloride materials, of which Geon resins, made and marketed by the chemical company, are among the most prominent. He was associated with the commercial development of these resins until his new assignment.

Paul C. Jones has been named field technical manager of the Goodrich Chemical company. Mr. Jones, with The B. F. Goodrich Co. since 1927, is a graduate in chemistry from the University of Michigan, obtaining his bachelor's and master's degrees there. He had been in research before he became technical representative on chemical sales, from which he goes to his new post.

Goodyear Announcements

Goodyear Tire & Rubber Co., Akron, plans to open late this month the Goodyear Products Exhibit, a permanent display which will reflect the myriad activities of the company. The display, located on the fourth floor of Goodyear Hall in Akron, will be open daily except Sunday to visitors.

One of the outstanding exhibits is the "Avenue of Tires," which will include one tire of every type or classification which Goodyear makes. Company activities to be represented by displays are the Goodyear textile mills in Alabama and Georgia, the coal mine in southern Ohio, the aviation plants in Ohio and Arizona, the research laboratories, synthetic rubber plants, and the shoe products and mechanical goods departments. Reproduced also are the plantations, now being won back from the Japanese. Rubber's application on the farm is also shown. The exhibit will also contain a permanent museum with a replica of the house in which Charles Goodyear, for whom the company was named, discovered the process of rubber vulcanization in 1839.

Ground has been broken at Akron Municipal Airport for a hangar to house Goodyear-owned planes. Besides facilities for ten planes it will also contain a repair shop and offices.

R. E. Davis, since September, 1941, manager of the aviation products department, has returned to his old post as manager of sales research. He came to Goodyear in 1928 as economic statistician and was assigned to the sales research position in May, 1937.

Paul W. Litchfield, chairman of the board of Goodyear Tire & Rubber Co. and president of Goodyear Aircraft Corp., last month marked his forty-fifth year with the Goodyear organization.

W. D. Shilts, Goodyear secretary, in June completed 40 years with the company.

Harry Blythe, vice president and general manager of Goodyear Aircraft, last month was awarded a 30-year service pin.

Goodyear Tire & Rubber employes will hold their annual around-the-clock picnic at Summit Beach Park on August 15. A similar picnic program for Goodyear Aircraft employes is scheduled for the next day.

Goodyear officials have revealed that 27,000 pairs of half tracs have been accepted by the Army without one rejection. The first production step is inspecting and brass plating metal bars; these are the core of every half trac. This plating insures the adhesion of rubber to the metal. Then the metal bars go to benches where cement is applied on both sides. Thin rubber strips are added, which are held in place by the cement to provide still further adhesion. At the next station the bars are bolted to the building wheel, 58 to each trac. Grooves inside the bars face upward to receive cables which add strength and provide flexibility. These cables are insulated, brass plated, and grounded by means of spiral wrapped wire to prevent static interference with radio operations. The rubber for the inside and outside treads of the half trac is measured and weighed and then cut with bias ends to ensure each piece fitting the next. Next the rubber strips are cemented to the inside and outside of the trac. The 525-pound half tracs are then moved to the curing room where in specially designed molds they are heated to a 290° temperature for about two hours. Their dependability on troop carriers makes these half tracs indispensable war weapons.

Curing Half Tracs at Goodyear

MIDWEST

Monsanto Appointments

Monsanto Chemical Co., St. Louis, Mo., will construct at its Merrimac Division plant just outside Boston, Mass., a $450,000 unit to produce Santocel. Work will get under way immediately, and it is expected that the unit will be operating at full capacity by the end of the year. Construction will be directed by Edward F. Riley, Monsanto construction superintendent, and Edmund S. Childs, Jr., assistant to Mr. Riley.

Santocel, a powdery substance, can be used in printing inks, in raincoats for preventing stickiness, in furniture to provide a dull sheen, and in rubber where it supplies strength without the discoloring effect of carbon black. However the greatest use of Santocel is expected to be in the insulating field. Several thin-walled refrigerators have been designed to incorporate Santocel as an insulating material, but, this work is still in the experimental stage. Use in military includes: rocket purposes (Navy), stratosphere chambers, aircraft package liners, shells, filler compounds for aircraft, radios and radar equipment, unbreakable insulated food containers for Army and Navy Air Corps, insulation of liquid oxygen tanks, AAF wheel chocks, cellophane gas capes, ponchos, Marine uniforms, and blood serum containers.

Transfer of Wendell P. Metzner to Monsanto's Central Research Laboratories at Dayton, O., effective August 6, has been announced. A graduate of Indiana University and the University of Chicago, Dr. Metzner started in Monsanto's St. Louis laboratories as a research chemist in August, 1936, and since May, 1940, has been research group leader of a group specializing in processes for organic intermediates. At Dayton he will head the flexible-type high polymer group.

He will be succeeded as a group leader in the organic chemicals divisions research laboratories by Harold L. Hubbard, a graduate of Alabama Polytechnic Institute, with Monsanto as a research chemist since August, 1935.

Alfred G. Rossow, who obtained his B.S. from Georgia Tech and his Ph.D. from the University of Wisconsin, is being transferred from Dayton to the St. Louis research laboratories. He was employed as a chemist at Monsanto's plastics division, Springfield, Mass., in June, 1941, and was transferred to Dayton in August, 1943.

Francis J. Curtis, Monsanto vice president, has been elected chairman of the American Section of the Society of Chemical Industry. He assumed his duties July 1, shortly after his return from Europe on a British-American mission to inspect German chemical plants. For the past year he had served as vice chairman of the same committee. Mr. Curtis is also vice chairman of the division of Industrial and Engineering Chemistry, American Chemical Society, and a director of the American Institute of Chemical Engineers.

Dr. le Beau Joins Midwest

Midwest Rubber Reclaiming Co., East St. Louis, Ill., which last year constructed a research and development laboratory in East St. Louis to provide facilities to supplement and enlarge upon the research program maintained by the company at Massachusetts Institute of Technology, Cambridge, Mass., has appointed as director of research Désirée S. le Beau, who for the past five years of the Midwest basic research program at M.I.T. was principal associate to Ernst A. Hauser. The new work at Midwest is concerned with research in the field lying between the basic program at M.I.T. and commercial development and application work, which will continue under Chief Chemist Robert L. Randall.

D. S. le Beau

Dr. le Beau was born in Teschen, Poland, and studied chemistry at the Universities of Vienna and Graz in Austria, receiving her Ph. D. in 1931. After passing the examination for college teachers in science, chemistry, and mathematics in 1931, she taught these subjects in junior college before going to the Austro-American Rubber Works Co., Vienna, as research and development chemist. In 1935 she became consultant to the Société de Progrés Techniques in Paris, a position held until leaving for the United States in 1936 to join the research staff of Dewey & Almy Chemical Co., Cambridge, Mass. Since 1940 she has been research associate in the department of chemical engineering at Massachusetts Institute of Technology. Dr. le Beau is a member of the A.C.S., A.A.A.S., Sigma Xi, and New York Academy of Science. She has specialized in colloid chemistry and has published a number of papers in the fields of rubber and clay.

Yale Rubber Mfg. Co. recently was incorporated for $300,000 to manufacture mechanical rubber goods, mainly molded, extruded, and cut items. The plant, consisting of three manufacturing and one office building is located in Yale, Mich.; while the branch store at 1433 Holden Ave., Detroit, Mich., handles all types of rubber goods. Executives of the company are: E. H. Henderson, president; C. N. Jaekel, vice president; W. V. Pepenbring, vice president and general manager; T. M. Johnson, treasurer; W. D. Hough, secretary; R. Henderson, assistant secretary and assistant treasurer; W. H. Laing, chief chemist.

S. C. Johnson & Son, Inc., Racine, Wis., has made Robert Paap merchandising manager of the industrial wax division. Mr. Paap has been with Johnson's since 1939, handling main line and industrial sales in Illinois, Indiana, Michigan, Ohio, and in the home office at Racine.

Inland Rubber Corp., Chicago, Ill., has named William A. Moore plant manager of its new factory under construction at Ottawa, Ill., for the manufacture of critically needed combat tires. Mr. Moore, until recently, was vice president and general manager of Armstrong Tire & Rubber Co., Natchez, Miss. He was for several years associated with Monsanto Chemical Co. and prior to that instructor of chemistry at the University of Akron.

Robert C. Dale has been appointed acting plant manager of Inland's Chicago plant on the South Side.

V. E. Ober has been appointed tire sales manager of Inland Rubber. For the past 12 years Mr. Ober was southeastern sales manager for Mansfield Tire & Rubber Co., Mansfield, O., with headquarters in Roanoke, Va., and later at Cleveland, O. Mr. Ober, a native of Baltimore Md., was a lieutenant (j.g.) in the U. S. Navy during World War I in which he saw three years' service.

Work on the new tire plant being built by Inland Rubber at Ottawa, Ill., has been suspended by order of the Defense Plant Corp. But Wm. M. Collins, Jr., president of Inland, stated that completion of the $9,000,000 plant as a private project by the rubber company was being studied.

Paisley Products, Inc., is enlarging and modernizing its four-story and basement factory at 1770 Canalport Ave., Chicago 16, Ill. This expansion program was necessitated by greatly increased demands for adhesives to meet the overseas packaging requirements of the Armed Forces. The firm, in its fourteenth year, has pioneered in the manufacture of synthetic resin, rubber, and vegetable base adhesives for packaging and fabricating requirements and for the printing, luggage, and paper converting trades. Postwar plans include expansion of the packaging adhesive line.

NEW ENGLAND

Godfrey L. Cabot, Inc., Boston, Mass., has appointed Raw Materials Co., 77 Franklin St., Boston, New England agent for its complete line of carbon blacks and pine tars. Raw Materials Co. recently was organized by the former Cabot general sales manager, C. W. Bloom.

American Resinous Chemicals Corp., Peabody, Mass., has announced that M. A. Kimmel now heads its adhesives department. His new responsibilities include direction of research and development in adhesives and full charge of adhesives sales. Mr. Kimmel is a graduate of Massachusetts Institute of Technology and has spent 17 years in the adhesive and resinous chemicals field.

L. B. Arnold, Jr., has joined the staff of Arthur D. Little, Inc., industrial research organization, Cambridge, Mass. Dr. Arnold was previously in the organic chemicals and rayon departments of E. I. du Pont de Nemours & Co., Inc., and more recently was an assistant director of the chemistry division of the Metallurgical Laboratory at Chicago, Ill.

Farrel-Birmingham Co., Inc., Ansonia, Conn., has appointed Robert M. Honegger general manager of its gear plant at Buffalo, N. Y. Mr. Honegger received both his early and technical education in his home city of Buffalo and first became associated with Farrel in 1925 as a member of the engineering department. In 1935 he was made general foreman and shortly after became plant superintendent, which position he held until this recent appointment. Mr. Honegger, in his present capacity, succeeds Lester D. Chirgwin, formerly of Buffalo and now of Ansonia who was elected vice-president in charge of manufacturing in all four Farrel-Birmingham plants.

CANADA

The Rubber Association of Canada held its regular annual meeting at the King Edward Hotel, Toronto, Ont., June 12, when Paul Jones, president, Dominion Rubber Co., Ltd., was elected president, succeeding J. I. Simpson president, Dunlop Tire & Rubber Goods Co., Ltd. F. A. Warren, president, Gutta Percha & Rubber, Ltd., was elected vice president, and R. J. Thomas president, Seiberling Rubber Co. of Canada Ltd., was chosen secretary-treasurer. Other directors are: Mr. Simpson; W. H. Funston, president, Firestone Tire & Rubber Co. of Canada; George W. Sawin, president, B. F. Goodrich Rubber Co. of Canada, Ltd.; A. G. Partridge, president, Goodyear Tire & Rubber Co. of Canada, Ltd.; W. H. Miner, president, Miner Rubber Co., Ltd.; H. S. Ireland, general manager, Canadian General Rubber Co. Later close to 100 persons, mainly senior officials of the leading rubber companies in the country or members of various committees established to advise A. H. Williamson, who recently resigned as Canadian rubber controller, attended a reception and dinner in Mr. Williamson's honor.

Polymer Corp., Sarnia, Ont., operated during the second quarter of 1945 with a 100% safety record, which meant that the participating companies, St. Clair Processing Corp., Canadian Synthetic Rubber, and Dow Chemical of Canada, along with Polymer employes, worked something like 300,000 hours without a disabling injury. Dow Chemical won the Berkinshaw Safety Award in the first quarter with an accident-free record.

The Kaufman Rubber Co., Kitchener, Ont., next spring will build an addition to the rear of its present plant as part of a program to expand activities. The new addition will be six stories high and will measure 40 by 100 feet.

Dominion Rubber Co., Kitchener, Ont., through A. W. Hopton, vice president and general manager, announced July 17 that it intends to enter into the plastic production field and that small molded plastic items for automotive parts already are in production.

The Merchants Rubber Co., Kitchener, Ont., expects to complete by November an addition costing $66,000 to house a Banbury mixer.

FINANCIAL

American Cyanamid Co., New York, N. Y. For 1944: net income, $6,660,144, or $2.20 a common share, against $6,653,118, or $2.27 a share, a year earlier. First quarter, 1945: net income, $1,463,063, equal to 54¢ each on 2,706,026 common shares, against $1,445,626, or 54¢ each on 2,666,026 shares; provision for renegotiation and taxes, $3,850,000, against $2,938,406.

American Zinc, Lead & Smelting Co., Columbus, O., and wholly owned subsidiaries. Year ended March 31, 1945: net profit, $909,957, equal to 84¢ a share, against $878,938, or 79¢ a share, in the preceding 12 months.

Anaconda Wire & Cable Co., New York, N. Y. For 1944: net profit, $1,225,282, equal to $2.90 a share, contrasted with $1,319,698, or $3.13 a share, in 1943; reserve for contingencies, $300,000, against $300,000; federal taxes, $3,840,000, against $2,580,000.

Brown Rubber Co., Inc., Lafayette, Ind. For 1944: net profit, $149,217, equal to 70¢ each on 211,100 shares, contrasted with $94,404, or 45¢ each on 207,000 shares, in 1943; current assets, $352,563; current liabilities, $190,676.

Crown Cork & Seal Co., Inc., Baltimore, Md., and wholly owned domestic subsidiaries. For 1944: net profit, $2,440,194, equal to $3.74 a common share, against $1,637,056, or $2.18 a share, in 1943; net sales, $62,842,150, against $53,506,813; taxes, $3,513,712, against $2,660,809.

Detroit Gasket & Mfg. Co., Detroit, Mich. For 1944: net profit, $511,658, equal to $2.18 a common share, compared with $519,096, or $2.21 a common share, for 1943.

Firestone Tire & Rubber Co., Akron, O., and subsidiaries. Six months ended April 30: net profit, $6,981,806, equal to $3.08 a common share, contrasted with $6,626,652, or $2.88 a share, in the corresponding period a year ago; taxes, $20,381,860, against $18,130,484; reserve for contingencies, $3,500,000, against $2,500,000.

General Electric Co., Schenectady, N. Y. First half, 1945: net profit, $24,793,533, equal to 86¢ a common share, compared with $20,770,700, or 72¢ a share, in the 1944 period; net sales, $684,633,672, against $693,070,838; federal income and excess profits taxes, $81,000,000, against $97,500,000.

Flintkote Co., New York, N. Y., and subsidiaries. Twelve weeks ended March 24: net income, $324,530, equal, after preferred dividends, to 28¢ each on 1,014,408 common shares, compared with $317,883, or 39¢ each on 713,706 shares, in the comparable period last year; reserve for contingencies, $40,000, against $50,000; provision for taxes, $789,969, against $692,075; net sales, $8,517,673, against $7,723,365.

Garlock Packing Co., Palmyra, N. Y., and subsidiaries. For 1944: net income, $869,876, equal to $4.15 each on 209,250 shares outstanding, against $999,359 the year before; working capital at year-end, $4,090,914, against $4,177,034.

General Motors Corp., New York, N. Y. For 1944: net sales, $4,262,249,472, compared with $3,796,115,800 in 1943; net income, $170,995,865, equal, after preferred dividends, to $3.68 each on 44,025,162 common shares outstanding, contrasted with $149,780,088, or $3.23 a share, the year before. First quarter, 1945: net income, $39,341,729, equal to 84¢ each on 44,013,759 common shares, against $41,060,455, or 88¢ a share, in the corresponding period one year ago.

Hercules Powder Co., Wilmington, Del. First three months, 1945: net income, $1,467,611, equal to $1.01 each on 1,316,710 common shares outstanding, contrasted with $1,137,958, or 76¢ a common share, in the first quarter last year; net sales, $28,259,973, against $26,560,896.

Hewitt Rubber Corp., Buffalo, N. Y. First three months, 1945: net income, $129,420, equal to 77¢ each on 168,188 shares; taxes, $350,000; net sales, $3,573,122.

I. B. Kleinert Rubber Co., New York, N. Y. and subsidiaries. For 1944: net profit, $276,462, or $1.70 a share, against $333,091, or $2.05 a share, in 1943.

Lee Rubber & Tire Corp., Conshohocken, Pa., and subsidiary. Six months to April 30: net profit, $776,028, equal to $3.21 each on 241,509 capital shares outstanding, contrasted with $644,863, or $2.67 a share, in the corresponding period a year ago; provision for federal income taxes, $2,071,403, against $1,753,753; net sales, $15,250,584, against $13,295,035.

Mansfield Tire & Rubber Co., Mansfield, O. For 1944: net income, $641,201, or $3.88 a common share including postwar refund, against $622,864, or $3.76 a share, in 1943; net sales, $25,076,820, against $20,244,463.

(Continued on page 644)

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Athol Mfg. Co.	Com.	$1.00 irr.	June 22	June 15
Anaconda Wire & Cable Co.	Com.	1.25	July 23	July 13
Baldwin Rubber Co.	Com.	0.17½	July 21	July 14
Converse Rubber Co.	Spec. Pfd.	0.15 irr.	July 23	July 16
Converse Rubber Co.	Pfd.	2.00 accum.	July 23	July 16
Dayton Rubber Mfg. Co.	Com.	0.25	July 25	July 10
Dayton Rubber Mfg. Co.	A	0.50 q.	July 25	July 10
Detroit Gasket & Mfg. Co.	Com.	0.25	July 25	July 7
Garlock Packing Co.	Com.	0.50 q.	June 30	June 23
Goodyear Tire & Rubber Co., Inc.	Com.	0.50 q.	Sept. 15	Aug. 15
Gro-Cord Rubber Co.	Com.	0.10	July 14	July 7
Lee Rubber & Tire Corp.	Com.	0.50 q.	Aug. 1	July 16
Midwest Rubber Reclaiming Co.	Com.	0.50 q.	Aug. 1	July 20
Tyer Rubber Co.	Pfd.	1.50 q.	Aug. 15	Aug. 10
United States Rubber Co.	Com.	0.50	Sept. 10	Aug. 20
United States Rubber Co.	8% 1st Pfd.	2.00	Sept. 10	Aug. 20

Patents and Trade Marks

APPLICATION

United States

2,376,864. **Sealing Ring of Deformable Resilient Material about a Shaft in a Mechanism Having a Pair of Members with Limited Relative Turning Movement about the Axis of the Shaft.** H. S. Eberhart, Peoria, Ill., assignor to Caterpillar Tractor Co., San Leandro, Calif.

2,376,871. **Respirator Mask.** R. Fink, Dayton, O.

2,376,909. **Screw Closure with Cushion of Resilient Material.** J. C. Ford, assignor to Celon Co., both of Madison, Wis.

2,377,019. **In a Tie Knot Shield, a Piece of Fabric and a Strip of Elastic Material.** W. H. Logan, Chicago, Ill.

2,377,050. **Detachable Shield Having Stretchable Sections, for Foundation Garments.** E. R. Sutter, assignor to Beau-T-Form Foundations, Inc., both of Chicago, Ill.

2,377,118. **Sealed Package Consisting of Thermoplastic, Porous Flexible Thin Paper-Like Material Resistant to Boiling Water.** M. Weisman, Roxbury, Mass., assignor to Mabe Corp., New York, N. Y.

2,377,153. **Electric Cable with a Dielectric Consisting of Normally Solid Polymers of Ethylene, and a Tube Between Conductor and Dielectric Composed Mainly of a Non-Metal Plastic Material.** P. V. Hunter, London, H. J. Allcock, Belvedere, and R. McL. Fairfield, Leigh, assignors to Callender's Cable & Construction Co., Ltd., London, all in England.

2,377,234. **Milking Appliance.** C. H. Howard, Isabel, S. Dak.

2,377,252. **In Filtering Apparatus of the Band-Filter Type, a Suction Box, an Endless Carrier Band of Elastic Material and a Perforated Elastic Band Traveling with the Carrier-Band.** H. Lehrecke, assignor to Aktiebolaget Kemiska Patenter, both of Landskrona, Sweden.

2,377,265. **Sealed Regulator Enclosure for a Vibrator; the Enclosure Includes a Base Having a Plate Member of Hard Insulation over which Is a Metallic Member Bearing a Non-Porous Body Member of Soft Rubber.** W. J. Rady, Anderson, Ind., assignor to General Motors Corp., Detroit, Mich.

2,377,274. **Ampule with Integral Partition of Plastic Material.** A. E. Smith, Los Angeles, Calif.

2,377,335. **Stress-Resisting Member Having a Basis of Textile Yarns Embedded in Plastic Material of Low Elasticity.** D. Finlayson and F. C. Hale, Spondon, England, assignors to Celanese Corp. of America, a corporation of Del.

2,377,439. **Meal-Reenforced Plastic Fly Swatter Blade.** V. J. Mueller, Peoria, Ill.

2,377,468. **Coupling with Torque Transmitting Members Housing Rubber Blocks.** A. Venditty, Detroit, Mich., assignor to Thompson Products, Inc., a corporation of O.

2,377,469. **In a Universal Joint, a Pair of Torque Transmitting Members Connecting Coupling Members; Each Torque Transmitting Member Has Oppositely Facing Open-Ended Channel Portions in Each of Which Is a Rubber Block.** A. Venditty, Detroit, Mich., assignor to Thompson Products, Inc.

2,377,491. **Waterproofed, Lightweight Materials.** H. R. Goodrich and G. Sucetti, both of Huntington Park, Calif., assignors to Universal Zonolite Insulation Co., Chicago, Ill.

2,377,492. **Flexible Engine Mount with a Rubber Cushion.** R. E. Gorton, assignor to United Aircraft Corp., both of East Hartford, Conn.

2,377,498. **Toy Including a Shaft to One End of Which Is Secured a Heavy Resilient Ball.** R. E. Jacke, Richmond, Va.

2,377,530. **In Combination with an Aircraft Member, a Jack Pad Including a Socket in Which Is Mounted a Block of Compressible, Resilient Material.** J. G. Villepigue, Inglewood, Calif., assignor to North American Aviation, Inc.

2,377,638. **Aircraft Tire with a Tread with Circumferential Channel, in Which Are Mounted Vanes for Movement from Positions of Tangency to Positions of Greater Angularity with the Adjacent Portion of the Tread's Circumferential Surface.** L. R. Lueck, El Monte, Calif.

2,377,650. **Conveyer Belt.** S. R. Reimel, Akron, O., assignor to B. F. Goodrich Co., New York.

2,377,674. **Hydraulic Structure Having a Sealing Element Including a Tubular Body of Resilient Elastic Material to Which Is Bonded a Core of Substantially Rigid Material.** H. L. Chisholm, Jr., Buffalo, N. Y., assignor to Houdaille-Hershey Corp., Detroit, Mich.

2,377,723. **In a Trailer Logging Bunk Including Shock Absorbing Means, a Pair of Resilient Apertured Bumper Blocks.** C. R. Shuey, Spokane, Wash.

2,377,794. **Ventilating and Pressure-Maintaining Device for Cabins of Aircraft, Vehicles, and Boats, Including a Hood and Inflatable Means for Sealing Its Edges.** M. J. O. Lobelle, assignor to R. Malcolm, Ltd., both of Slough, England.

2,377,820. **Wringer Assembly.** T. R. Smith, assignor to Maytag Co., both of Newton, Iowa.

2,377,837. **In an Applicator Brush Having a Head with Fluid Containing Chamber, a Block of Sponge Rubber Secured to the Head.** W. F. Zimmermann, Burlington, N. J.

2,377,865. **Life Preserver Consisting of a Vest to Support the Wearer in an Inclined Position.** R. E. Coombs, Washington, D. C., assignor to United States Government as represented by the Secretary of the Navy.

2,377,880. **In Abrading Tools Which Include a Service Band or Sleeve Carried by a Rotatable Drum and Held in Position by Centrifugal Force, an Annular Rim Zone of Rubber-Like Material on the Drum.** R. S. Gutsell, Carthage, N. Y.

2,377,963. **Collapsible Boat.** L. E. Rabjohn, Glendale, Calif.

2,377,998-2,378,000. **Trim Panel, Including Bead of Plastic Material.** E. R. Detrick, assignor to National Automotive Fibers, Inc., both of Detroit, Mich.

2,378,087. **Ice Pack Including a Bag of Thin Flexible Rubber.** J. M. Kearney, Cambridge, Mass.

2,378,095. **Shaft Seal Having a Ring of Rubber-Like Sealing Material.** F. E. Payne, Winnetka, Ill., assignor to Crane Packing Co., Chicago, Ill.

2,378,102. **Composition for Vehicle Tires, Including Wood Ash, Cotton Fibers, Reclaimed Rubber, Sawdust, Sand, and Waterproof Glue.** G. Provenzano, New York, N. Y.

2,378,126. **Liquid Storage Container.** G. W. Blair, Mishawaka, Ind., assignor to United States Rubber Co., New York, N. Y.

2,378,128. **Readily Assembled and Dismounted Liquid Storage Tanks.** J. S. Cates, South Bend, Ind., assignor to United States Rubber Co., New York, N. Y.

2,378,130. **Cushion Tire.** C. A. Colgren, Jeffersonville, Ind.

2,378,159. **Storage Tank for Liquids.** J. T. Royer, Mishawaka, Ind., assignor to United States Rubber Co., New York, N. Y.

2,378,161. **Liquid Storage Device.** F. A. Sawyer, South Bend, Inc., assignor to United States Rubber Co., New York, N. Y.

2,378,291. **Laminar Structure Consisting of a Sheet of a High Molecular Weight Acrylate Polymer Bonded to a Nitro-Cellulose Coated Surface of a Cellulose Ether Sheet with a Bonding Agent of the Class of Polymers and Copolymers of Acrylic and Methacrylic Esters.** F. C. Dulmage and T. A. Kauppi, assignors to Dow Chemical Co., all of Midland, Mich.

2,378,322. **Porous Insulating Articles from Exfoliated Vermiculite Made with the Aid of a Water-Soluble Heat-Setting Resin.** N. R. Peterson, assignor to Dow Chemical Co., both of Midland, Mich.

2,378,380. **Combination Protective Shield and Accessories Holding Bib for Beauty Salons.** G. D. Brown, West Los Angeles, Calif.

2,378,445. **Metallic Body Coated with a Primer Coat of Relatively Insoluble Dried Copolymers of Styrene and Benzene-Soluble Resinous Polycyclopentadiene and a Top Coat of a Polymerized Vinyl Compound.** F. J. Soday, Swarthmore, Pa., assignor to United Gas Improvement Co., a corporation of Pa.

2,378,446. **Shaped Metallic Body Coated with a Primer Coat of Relatively Insoluble Dried Copolymer of Methyl Styrene and Benzene Soluble Resinous Polycyclopentadiene and a Top Coat of a Polymerized Vinyl Compound.** F. J. Soday, Swarthmore, Pa., assignor to United Gas Improvement Co., a corporation of Pa.

2,378,467. **Accumulator Bladder Including a Molded Bag Having Two Portions, One of Which Is Made from a Relatively Stiff Compound, and the Other from a Relatively Flexible Compound.** N. de Kiss, North Hollywood, Calif., assignor by mesne assignments to Bendix Aviation Corp., South Bend, Ind.

2,378,477. **Moldable Fiber and Resin Composition.** A. J. Hanley, Edgewood, R. I., assignor to Bakelite Corp., New York, N. Y.

2,378,508. **Eye Guard Including a Substantially Tubular Member of Resilient Material.** G. F. Smyth, Pittsford, assignor to Bausch & Lomb Optical Co., Rochester, both in N. Y.

2,378,511. **Heel.** H. A. Strupp, Evansville, Ind.

2,378,517. **An Accumulator Including a Shell to Which Is Secured a Bladder Having a Flexible and a Stationary Part.** W. C. Trautman, North Hollywood, Calif., assignor by mesne assignments to Bendix Aviation Corp., South Bend, Ind.

2,378,543. **Elastic Work Holder Attachment for Vise Jaws.** H. P. Fest, Monrovia, Calif.

2,378,563. **Apparatus Including a Metallic Net of Large Area and a Plurality of Captive Balloons Connected with the Net.** A. J. Lakatos, Jr., Dayton, O.

2,378,673. **Shoe Stiffener Blanks Having a Fibrous Base Impregnated and Coated with a Solidified Solution of Rubber Dissolved in a Thermoplastic Material.** J. W. Wiley, Lancaster Township, Pa., assignor to Armstong Cork Co., Lancaster, both in Pa.

2,378,718. **Fountain Syringe.** P. S. Madsen, Bethany, and A. A. Arnold, Hamden, assignors to Seamless Rubber Co., New Haven, all in Conn.

2,378,738. **Rubber Drill Pipe Protector.** W. G. L. Smith, Los Angeles, Calif., assignor to Thermoid Co., Trenton, N. J.

2,378,773. **Rubber-Coated Glove or Mitten.** V. H. Hurt, Cranston, R. I., assignor to United States Rubber Co., New York, N. Y.

2,378,791. **In an Ignition Coil, a Layer of Vulcanized Flexible Rubber-Like Material Surrounding the Covering on the Secondary Winding of a Metallic Core.** E. E. Robinson and E. W. J. Barrington, assignor to Rotax, Ltd., all of London, England.

2,378,845. **Flexible Wall Element for Ice Tray.** R. L. Hallock, Larchmont, N. Y.

2,378,874. **Engine Mounting with Normal Torque Resisting Means Including Rubber.** R. S. Trott, Denver, Colo.; E. J. Trott, executrix of R. S. Trott, deceased.

2,378,924. **Inflation Unit for Attachment to One Side of an Inflatable Flotation Device.** J. A. Honegger, Bloomfield, and A. W. Keeshan, Belleville, assignors to Kidde Mfg. Co., Inc., Bloomfield, both in N. J.

2,378,929. **Respirator.** W. J. Joyce, Sturbridge, assignor to American Optical Co., Southbridge, both in Mass.

2,379,095. **Spring Tire.** F. R. Mays, Chicago, Ill., and R. R. Royal, Paducah, Ky.

2,379,126. **Liquid Storage Cell of Rubber-Like Material Adapted to Be Placed Within a Hollow Retaining Structure and Designed to Hold Surge Plates.** G. R. Welden, Baltimore, assignor to Glenn L. Martin Co., Middle River, both in Md.

2,379,139. **Sole Structure.** J. H. Fink, Watertown, Mass., assignor to B. F. Goodrich Co., New York, N. Y.

2,379,193. **Gasket Element Including a Hollow, Elongated Cushioning Member of Rubber-Like Material.** A. L. Shields, Springfield, Mass., assignor to Westinghouse Electric Corp., East Pittsburgh, Pa.

2,379,330. **Massaging and Shampooing Scalp Reservoir Brush Including a Rubber Body.** H. L. Wilensky, New York, N. Y.

Dominion of Canada

427,750. **Wheel Cover Structure Including a Cover Member of Form-Sustaining, But Resiliently Yieldable Plastic Material.** G. A. Lyon, Allenhurst, N. J., U. S. A.

427,752-427,753. **Wheel Cover Structure Including a Cover Member of Form Sustaining, But Yieldable Material.** G. A. Lyon, Allenhurst, N. J., U. S. A.

427,754. **In a Wheel Construction, a Wheel Cover Including an Outer Annular Trim Ring Section of Highly Flexible, Resilient Material.** G. A. Lyon, Allenhurst, N. J., U. S. A.

427,755. **In a Wheel Structure, a Circular Wheel Cover Having a Central Circular Part and Resiliently, Elastically Flexible Annular Ring.** G. A. Lyon, Allenhurst, N. J., U. S. A.

427,830. **For Textile Machinery a Draft Apron of Rubber-Like Material Reenforced with Textile Fibers.** Dayton Rubber Mfg. Co., assignee of A. L. Freedlander and H. M. Bacon, all of Dayton, O., U. S. A.

427,836. **Electrically Heated Sinus Pad.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of L. Marick, Grosse Pointe Farms, Mich., U. S. A.

427,840. **A Lightweight Storage Battery Container of Aluminum, the Inner Surface of Which Is Coated with a Prime Coat of Chlorinated Rubber Base Resin, an Enamel Coat, and a Seal Coat of a Copolymer of Vinyl Chloride and Vinyl Acetate.** Electric Storage Battery Co., assignee of C. Duddy, both of Philadelphia, Pa., U. S. A.

427,857. **Sealing Tape Coated with a Mixture of an Aqueous Emulsion and a Water-Insoluble Resinous Adhesive and a Non-Reacted Urea Formaldehyde Resin Such as Plaskon.** McLaurin-Jones Co., Brookfield, assignee of L. Davis, Worcester, and A. J. Gauthier, Brookfield, both in Mass., U. S. A.

427,858. **Sealing Tape Coated with Thermoplastic Adhesive Composition Including Asphalt Blended with an Adhesive from the Group Including Pliolite and Gelva.** McLaurin-Jones Co., Brookfield, assignee of L. Davis and E. C. Tuukkanen, both of Worcester, Mass., U. S. A.

427,913. **Vacuum Milking Apparatus.** P. J. Packman and F. G. Miles, both of Twyford, and L. H. Whatley, Wokingham, both in Berkshire, England.

427,917. **Apparatus for Storing and Projecting a Liquid, Including a Longitudinal Elastic Rubber Vessel.** L. H. Armitage, Enfield, Middlesex, England.

427,948. **Bottle Scrubber Including a Central Stem of Resilient Material and Radial Resilient Blades.** E. N. Yden, Colbert, Wash., U. S. A.

428,023. **A Bondable Article Including Parts of Cellulosic Sheet Sealable with a Coating of Water-Soluble Fusible Partially Hydrolyzed Polyvinyl Acetate Resin.** Shawinigan Chemicals, Ltd., Montreal, assignee of G. O. Morrison and T. P. G. Shaw, all of Shawinigan Falls, both in P. Q., Canada.

428,047. **Plastic Supported Winding Element.** F. J. Sigmund and W. S. Hlavin, both of Cleveland, O., U. S. A.

428,055-428,057. **Elastic Paint Mask.** J. E. Duggan, Birmingham, Mich., U. S. A.

428,068. **Vaporizer with Bulb-Like Container and Discharge Tube.** W. M. V. Lynch, Upper Darby, Pa., U. S. A.

428,135. **For Ice-Prevention on Airplane Parts, a Heating Device Including a Laminated Sheet; the Inner Layer, Constituting the Heating Element, Is Composed of Fabric Impregnated with Neoprene Containing Unmilled Acetylene Black; While an Outer Layer of Neoprene-Impregnated Fabric and Another of Neoprene Are Respectively Insulating and Protective Layers.** Honorary Advisory Council for Scientific and Industrial Research, assignee of T. R. Griffith and J. L. Orr, all of Ottawa, Ont.

428,173. **Flexible, Weatherproof Light Reflector Sheet.** Minnesota Mining & Mfg. Co., assignee of H. Heltzer and J. E. Clarke, all of St. Paul, Minn., U. S. A.

428,194 **Gasket Material of Polymerized Chloroprene Compound.** L. Daly, Birmingham, Mich., U. S. A.

428,235. **Wire Polishing Apparatus Including an Elastic Polishing Member.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. L. Leithiser, York, Pa., U. S. A.

428,256. **For an Electrical Conductor, an Asbestos Insulation Saturated with a Compound Consisting of Chlorinated Diphenyl and Paraffin Wax Plasticized with a Mixture of Polyisobutylene and Corn Oil.** Canada Wire & Cable Co., Ltd., Leaside, Ont., assignee of General Cable Corp., New York, assignee of J. N. Aken, Rome, both in N. Y., U. S. A.

428,282. **Friction Element Having a Wire Cloth Reenforcing Insert Coated with a Baked Resinous Composition.** Raybestos-Manhattan, Inc., Bridgeport, assignee of Gilbert & Bennett Mfg. Co., Georgetown, assignee of D. H. Miller and P. H. Knowles, both of Cannondale, and W. A. Hughes, Georgetown, all in Conn., U. S. A.

United Kingdom

568,777. **Electric Cable Systems.** Okonite-Callender Cable Co.

569,076. **Abrasive Articles.** United States Rubber Co.

569,239. **Resilient Wheels.** Dunlop Rubber Co., Ltd., B. W. D. Lacey, and H. R. Willcocks.

569,272. **Resilient Couplings.** Rubber Bonders, Ltd., C. Whittingham, and N. Beck.

569,301. **Aircraft Anti-Icing or De-Icing Arrangements.** Pesco Products Co.

569,323. **Diving Equipment.** Trubenized, Ltd., and L. Bihaly.

569,336. **Endless Tracks for Vehicles.** Roadless Traction, Ltd., and P. H. Johnson.

PROCESS

United States

2,376,922. **Pile Fabrics.** W. H. King, assignor to Behr-Manning Corp., both of Troy, N. Y.

2,377,208. **Cemented Shoes.** W. C. Card, Sr., Winthrop, assignor to Compo Shoe Machinery Corp., Boston, both in Mass.

2,377,231. **Preparing a Decorative Article from a Mixture of Polystyrene and a Vinyl Resin.** R. F. Hayes, North Wilbraham, Mass., assignor to Monsanto Chemical Co.,' St. Louis, Mo.

2,377,339. **Sponge Rubber Knee Pads.** I. H. Greene, New York, N. Y.

2,377,358. **Forming Thermoplastic Coated Containers.** G. A. Moore, New York, N. Y., assignor to Shellmar Products Co., Mt. Vernon, O.

2,377,393. **Forming Plastic-Coated Containers.** L. M. Wiley, assignor of one-third to R. B. Wiley and one-third to J. T. Lett, all of Marion, Ind.

2,377,490. **Incorporating Elastic Thread in Portions of a Circular Knit Fabric.** J. L. Getaz, New York, N. Y.

2,377,810. **Crinkled Filament from Polymeric Vinylidene Chloride.** W. B. Robbins, assignor to Dow Chemical Co., both of Midland, Mich.

2,377,908. **Extruded Thermoplastic Tubing.** C. E. Slaughter, New Canaan, assignor to Extruded Plastics, Inc., Norwalk, both in Conn.

2,377,928. **Treating a Cast Rod of a Thermoplastic Resin from the Group of the Polymerized Esters of Acrylic and Methacrylic Resins.** F. J. Fielitz, Belleville, and B. M. Marks, Newark, both in N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,378,034. **Table Tennis Balls from Thermoplastic Materials.** G. H. Perryman, Teaneck, N. J.

2,378,598. **Coating Non-Metallic Surfaces with a Partially Condensed Condensation Resin in Liquid Form.** H. J. Thielker, assignor to Western Electric Co., both of New York, N. Y.

2,378,642. **Plastic-Bound Long-Fiber Hollow Bodies.** K. J. Kopplic, Normandy, assignor to F. Burkhart Mfg. Co., St. Louis, both in Mo.

2,378,700-2,378,702. **Hollow Articles from Liquid Dispersions of Rubber.** E. E. Habib and G. E. Gott, Arlington, assignors to Dewey & Almy Chemical Co., North Cambridge, both in Mass.

2,378,717. **Reuse of Vulcanized Synthetic Rubber Scrap.** J. H. Macey, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,378,882. **Hollow Articles from Liquid Dispersions of Rubber.** E. E. Habib and G. E. Gott, Arlington, assignors to Dewey & Almy Chemical Co., North Cambridge, both in Mass.

2,378,990. **Recovering Rubber Latex from Plants Which Exude Latex When Cut.** T. F. Ford, Arlington, Va.

2,379,122. **Inner Tubes.** J. W. Waber, Chicago, Ill.

2,379,163. **Molded Product from Fibrous Material and a Heat-Curable Resinous Binder.** K. L. Landon, Wilkinsburg, Pa., assignor to Westinghouse Electric Corp., East Pittsburgh, Pa.

2,379,166. **Friction Lining from a Fiber-Containing Compound Having an Oil-Modified Thermosetting Resin as Binder.** D. E. Lucid, Dayton, O., assignor to General Motors Corp., Detroit, Mich.

2,379,311. **Cut Seamed Articles from Rubber Sheet.** F. S. Martin, Providence, R. I., assignor to United States Rubber Co., New York, N. Y.

Dominion of Canada

427,808. **Bonding Pieces of Cast Methacrylate Polymer.** Canadian Industries, Ltd., Montreal, P. Q., assignee of R. E. Leary, Newark, N. J., U. S. A.

427,867. **Laminated Material for Use in Making Articles from Superposed Sheets of Laminar Material Impregnated with a Plastic.** Pilkington Brothers, Ltd., Liverpool, assignee of C. F. Griffith, Huyton, and P. R. Bradley, Prescott, all in Lancaster, England.

427,876. **Molding a Telephone Handset from Organic Plastic Material.** Shaw Insulator Co., Irvington, assignee of F. H. Shaw, South Orange, both in N. J., U. S. A.

428,296. **Reenforced Compressible Cushion of Spongy Rubber-Like Material.** United States Rubber Co., New York, N. Y., assignee of M. M. Cunningham, South Bend, Ind., both in the U. S. A.

United Kingdom

568,751. **Treatment of Metal Surfaces before Bonding Rubber thereto.** Andre Rubber Co., Ltd., and S. Buchan.

568,775. **Electrical Cable.** R. M. Chamney.

568,819. **Laminated Shaped Articles.** F. Hills & Sons, Ltd., S. Partridge, and R. Tither.

568,843. **Anti-Skid Tires.** Wingfoot Corp.

568,890. **Melt Extrusion of Synthetic Polymers.** E. I. du Pont de Nemours & Co., Inc.

569,073. **Shaped Articles from Synthetic Linear Polyamide.** E. I. du Pont de Nemours & Co., Inc.

569,093. **Hollow Articles from Thermoplastic Materials.** Dixon Plastics, Ltd., and F. H. Tonsley.

569,115. **Composite or Multiply Web or Sheet Material or Articles.** J. C. Nicholson and British Artificial Resin Co., Ltd.

569,116. **Laminated Fibrous Sheet Materials and Laminated Fabrics.** J. C. Nicholson and British Artificial Resin Co., Ltd.

569,155. **Injection Molding of Thermoplastic Materials and the Like Which Are Plastic When Hot.** A. D. Ferguson, Metropolitan Vickers Electrical Co., Ltd., and D. Bridge & Co., Ltd.

569,183. **Molding Compositions and Products thereof.** American Cyanamid Co.

569,188. **Impregnation of Regenerated Cellulose Staple Fibers.** Rohm & Haas Co.

569,340. **Shaping of Thermoplastic Sheets.** J. S. Byers, F. T. Hamblin, and Imperial Chemical Industries, Ltd.

CHEMICAL

United States

2,376,865. **Ether of Endoethylene Hydroxycyclopentanoindane.** H. A. Bruson, assignor to the Resinous Products & Chemical Co., both of Philadelphia, Pa.

2,376,961. **Producing Butadiene by Heating a Charging Stock Containing More Diisopropyl Than Any Other Hydrocarbon, to 1200 to 1650°** F. E. L. d'Ouville and A. G. Oblad, assignors to Standard Oil Co., all of Chicago, Ill.

2,376,963. **Polymerization of a Butadiene-1,3 in the Presence of an Aromatic Diazo Compound.** B. S. Garvey, Jr., Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,376,964. **Production of Vinyl Esters by Reacting an Acetylene Hydrocarbon with a Compound Containing a Free Carboxylic Group in the Presence of a Mercury Salt of a Fluorophosphoric Acid.** B. S. Groth and S. B. H. Johanson, both of Ornskoldsvik, Sweden.

2,376,985. **Producing Styrene from Butadiene, Which Includes Polymerizing Butadiene, and Separating from the Polymerization Products a Butadiene Dimer Fraction Which Is Treated with an Aromatization Catalyst to Convert It into Styrene and Ethyl Benzene.** V. Voorhees, Homewood, assignor to Standard Oil Co., Chicago, both in Ill.

2,376,986. **Making Butadiene by Subjecting Ethylene to Controlled Oxidation to Produce Oxidation Products of Ethylene, and Then Condensing Additional Ethylene with the Oxidation Products in the Presence of a Dehydrating Catalyst.** B. H. Shoemaker, Hammond, Ind., assignor to Standard Oil Co., Chicago, Ill.

2,376,987. **Preparing Butadiene from a Feed Stock Including Ethylene Oxide and Ethyl Alcohol.** S. B. Becker, Chicago, and M. H. Arveson, Flossmoor, assignors to Standard Oil Co., Chicago, both in Ill.

2,376,988. **Preparing Dienes from an Alkyl Sulphide Having at Least Four Carbon Atoms.** B. H. Shoemaker, Hammond, Ind., assignor to Standard Oil Co., Chicago, Ill.

2,377,025. **Forming 1,3-Butadiene from a Mixture of Acetaldehyde and Ethylene.** H. Miller, Columbia, Mo., assignor by mesne assignments to National Agrol Co., Inc., Washington, D. C.

2,377,052. **Improved Method of Preparing Aqueous Dispersion of Reclaimed Rubber.** A. M. Stover, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,377,085. **Preparing Compounds of the Group of Vinyl Haloformates and Alkyl Substituted Vinyl Haloformates by Pyrolyzing Bis (Haloformates) of Alkylene Glycols Which Have the Two Hydroxy Groups on Adjacent Carbon Atoms.** F. E. Kung, Akron, O., assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

2,377,095. **Infusible Insoluble Polymer from an Unsaturated Alcohol Polyester of Phthalic Acid.** I. E. Muskat, Akron, O., assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

2,377,214. **Plastic Composition Including a Polyvinyl Butyraldehyde Acetal Resin.** E. R. Derby, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,377,221. **Separating a Vinyl Benzene of the Class of Styrene and Its Homologs from Mixtures with Ethyl Benzene.** A. W. Francis, Woodbury, N. J., and E. E. Reid, Baltimore, Md., assignors to Socony Vacuum Oil Co., Inc., a corporation of N. Y.

2,377,237. **Coating Composition from Aqueous Zein Dispersions Including besides Zein, Sulphonated Castor Oil, Urea, Glycerine, Butyl Alcohol, and Water.** A. L. James, Western Springs, Ill., assignor to Corn Products Refining Co., New York, N. Y.

2,377,297. **Monochloro-Monofluoro-Alkene.** N. Lamb, Saginaw, and W. C. Mast, Bay City, assignors to Dow Chemical Co., Midland, all in Mich.

2,377,352. **Isomerizing Butene-1 to Butene-2 under Isomerizing Conditions in the Presence of a Catalyst Including Magnesium Fluoride.** W. J. Mattox, Riverside, assignor to Universal Oil Products Co., Chicago, both in Ill.

2,377,422. **Alcohol Modified Urea Formaldehyde Resinous Condensation Products Which Are Clear, Stable, Water-White Hydrocarbon Soluble and Rapidly Heat Convertible.** T. S. Hodgins and P. S. Hewitt, Royal Oak, assignors to Reichhold Chemicals, Inc., Detroit, both in Mich.

2,377,423. **As Antioxidant, a Product of Reaction of One Molecular Proportion of a Monomeric 1,3-Butadiene Hydrocarbon and at Least One Molecular Proportion of a Primary Aromatic Polyamine Compound.** L. H. Howland, Cheshire, and P. T. Paul, Naugatuck, both in Conn., assignors to United States Rubber Co., New York, N. Y.

2,377,579. **Conjugated Straight Chain Diolefins from the Corresponding Olefins.** W. A. Schulze, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Dela.

2,377,580. **Conversion of Butenes to Butadiene.** W. A. Schulze, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Dela.

2,377,585. **N-Vinylchlorurethane.** H. P. Staudinger, Ewell, and K. H. W. Tuerck, Banstead, both in England, assignors to Distillers Co., Ltd., Edinburgh, Scotland.

2,377,600. **Semi-Conducting Composition Including Finely Divided Anthracite Coal of Colloidal Dimensions Embodied in a Polymerized Phenyl Ethyl Silicone.** H. H. Barker, Irwin, and L. R. Hill, Wilkinsburg, assignors to Westinghouse Electric & Mfg., East Pittsburgh, all in Pa.

2,377,630. **New Dielectric Composition Espe-**

cially Adapted for Impregnating Cellulosic Material, Including a Liquid Hydrogenated Hydrocarbon Dielectric Stabilized with Naphthalene to Which Has Been Added Tetralin. J. L. Hyde, Williamstown, assignor to Sprague Specialties Co., North Adams, both in Mass.

2,377,647. **Age-Resistant, Highly Tacky Adhesive Composition Including Rubber, Dehydrogenated Rosin, Lanolin, and Zinc Oxide.** E. Pragoff, Jr., assignor to Hercules Powder Co., both of Wilmington, Del.

2,377,734. **Synthetic Resin Produced by Polymerizing a Liquid Water-Soluble Condensation Product of a Saturated Aliphatic Aldehyde with a Saturated Aliphatic Ketone.** T. C. Whitner, Elizabeth, N. J., assignor to Chemical Laboratories, Inc., a corporation of New Jersey.

2,377,752. **Forming a Polyvinyl-Halide by Polymerizing Vinyl Halide in a Mixture Including an Acid, a Peroxide, a Ferric Compound, and a Liquid Medium Selected from the Class of Water and Mutual Solvents of the Other Ingredients Mentioned.** J. W. Britton and R. C. Dosser, assignors to Dow Chemical Co., all of Midland, Mich.

2,377,779. **Polymerizing Ethylene.** W. E. Hanford and J. R. Roland, both of Wilmington, Del., and H. S. Young, Fairville, Pa., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,377,787. **Vulcanizing Rubber in the Presence of an Amine Having the Structure:**

$$\begin{matrix} R_1-S-A_1 \diagdown & \\ & N-A_3-S-R_3 \\ R_2-S-A_2 \diagup & \end{matrix}$$

Where A_1, A_2, A_3 Are Alkylene Groups and R_1, R_2, and R_3 Are Each an Organic Radical with the Free Valence on a Carbon Atom, not More Than Two Such Radicals Being Identical. P. C. Jones, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,377,847. **Low-Boiling Diolefin Hydrocarbons.** J. G. Allen and I. L. Wolk, both of Bartlesville, Okla., assignors to Phillips Petroleum Co., a corporation of Del.

2,377,914. **Improved Process of Producing Light-Colored Amorphous, Clear, Glassy, Stable Chlorinated Solid Resins from Petroleum Hydrocarbons.** C. E. Adams, Highland, Ind., assignor to Standard Oil Co., Chicago, Ill.

2,377,927. **Liquid Roofing Compound Made from a Resinous Mixture Including Para-Coumarone Indene, Rosin Modified Phenol-Formaldehyde Resin, Mineral Asphalt, Drying Fish Oil and Naphtha, and a Bituminous Mixture Including Liquid Petroleum Asphalt and Asbestos Fibers.** C. M. Evans, Shaker Heights, assignor to Master Mechanics Co., Cleveland, both in O.

2,377,952. **Preparing Methyl Methacrylate Monomer from Polymeric Methyl Methacrylate.** B. M. Marks, Newark, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,378,015. **Preparation of the Polyvinylether of Beta-Guanylethanol.** R. C. Houtz, Snyder, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,378,030. **To Produce Synthetic Elastomers, the Process of Polymerizing a Conjugated Diolefin Hydrocarbon in Aqueous Emulsion Containing Tertiary Alkyl Mercaptan Having between Eight and 16 Carbon Atoms.** J. F. Olin, Grosse Ile, Mich., assignor to Sharples Chemicals, Inc., Philadelphia, Pa.

2,378,089. **Heat-Polymerization of Styrene in the Presence of a Formaldehyde Compound to Modify the Course of Polymerization so as to Produce a Polymer of High Molecular Complexity.** A. R. Krotzer, Philadelphia, Pa., W. A. King, Memphis, Tenn., and J. H. Kleiner, Atlantic City, N. J., assignors by mesne assignments to Allied Chemical & Dye Corp., a corporation of N. Y.

2,378,140. **Synthetic Rubber-Like Material Obtained by Interpolymerizing a Compound of the Class of Butadiene-1,3, 2-Chloro-Butadiene-1,3, and Their Methyl and Dimethyl Homologs, and a Compound of the Class of Chloro-Cyano-Butadiene-1,3 and Its Methyl Homologs.** H. Gudgeon, E. Isaacs, and W. McG. Morgan, Blackley, Manchester, England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,378,141. **Obtaining Quebrachitol from Rubber Latex Serum.** W. J. Hart, Warren Point, N. J., assignor to United States Rubber Co., New York, N. Y.

2,378,152. **Recovering Hard Copal Resins of the Kauri Type from Resin-Bearing Coals.** A. Nagelvoort, Salt Lake City, Utah.

2,378,160. **Dielectric Material Consisting of an Eutectic Mixture of Coumarone-Indene-Cyclopentadiene Resin and Ethyl Pentachlorbenzene.** S. Ruben, New Rochelle, N. Y.

2,378,183. **Yarn of High Resiliency and Elasticity from a Solution Including a Cellulose Organic Ester Dissolved in a Volatile Solvent and a Partially Polymerized Phenol-Urea-Formaldehyde Resin.** J. R. Caldwell, Kingsport, Tenn., assignor to Eastman Kodak Co., Rochester, N. Y.

2,378,189. **Copolymer Consisting of a Conjugated Butadiene Having a Chlorine Substituent in at Least One of the 2- and 3- Positions, a Conjugated Hydrocarbon Butadiene, and Vinylidene Chloride.** A. M. Clifford, Stow, and W. D. Wolfe, Cuyahoga Falls, assignors to Wingfoot Corp., Akron, all in O.

2,378,194. **Interpolymer of Vinyl Chloride and an Itaconic Ester.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,378,195. **Producing Partially Polymerized Products from a Solution of Divinyl Benzene in a Dialkyl Benzene Having at Least Two Carbon Atoms in Each Alkyl Grouping, in the Presence of Both an Inhibitor and a Catalyst for Polymerization.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,378,196. **Producing a Fusible, Heat-Convertible Partial Polymer of Coreacted Divinyl Benzene and Carbon Tetrachloride.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,378,197. **Partial Copolymer of Divinyl Benzene and a Compound of the Class of Allyl, Methallyl, and Chlorallyl Alcohol Esters of Unsaturated Monocarboxylic Acids; Allyl and Methallyl Unsaturated Alcohol Polyesters of Saturated Aliphatic and Aromatic Polycarboxylic Acids; Unsaturated Ethers and Unsaturated Ketones.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,378,198. **Reaction Products of Aldehydes and Triazine Derivatives.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,378,199. **Synthetic Resinous Compositions Including Intercondensation Products of Vinyl Esters, Guanazoles, Aldehydes, and/or Ketones.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,378,230. **Dispersion of Insoluble, Gelled, Polycarboxylic Acid-Polyhydric Alcohol Resin in an Organic Solvent, Normally a Solvent for the Ungelled Resin, with Morpholine as Dispersing Agent.** J. G. Little, assignor to Hercules Powder Co., both of Wilmington, Del.

2,378,269. **Vulcanizing Rubber in the Presence of an Amine Salt of a 2-Mercapto 4-Aryl Thiodiazole 5-Thione.** G. W. Watt, Austin, Tex., assignor to Wingfoot Corp., Akron, O.

2,378,288. **Polyvinyl Acetal Resin Plasticized with a Mixture of Diethylene Glycol Dipropionate and Butyl Carbitol Butyrate.** E. R. Derby, Springfield, Mass., assignor by mesne assignments to Monsanto Chemical Co., St. Louis, Mo.

2,378,363. **Coating Composition Containing Hydrogenated Methyl Abietate and a Melamine-Formaldehyde Resin Which Has Been Reacted with an Alcohol from the Group of Ethylene Chlorhydrin, Propyl Alcohols, Butyl Alcohols, Benzyl Alcohols, and Octyl Alcohols.** R. C. Swain, Riverside, and P. Adams, Stamford, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,378,364. **Coating Composition Containing Batavia Dammar Resin and a Melamine-Formaldehyde Resin Reacted with an Aliphatic Acyclic Alcohol.** R. C. Swain, Riverside, and P. Adams, Stamford, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,378,365. **Coating Composition Containing Polymeric Methyl Methacrylate and a Melamine-Formaldehyde Resin Reacted with an Alcohol Containing Four to Eight Carbon Atoms.** R. C. Swain, Riverside, and P. Adams, Stamford, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,378,366. **Coating Composition Containing Rosin-Modified Phenol-Formaldehyde Resin and a Melamine-Formaldehyde Resin Reacted with a Monohydric Alcohol Containing Four to Eight Carbon Atoms.** R. C. Swain, Riverside, and P. Adams, Stamford, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,378,377. **Preformed, Composition Tile, the Binder for Which Includes a Hard Resin from the Group of Polymers of Coumarone, Indene, and Styrene; and Alkyl Resin and a Plasticizer for Both Resins.** M. K. Bare, assignor to Armstrong Cork Co., both of Lancaster, Pa.

2,378,436. **Condensation Product of a Mixture of a Phenol and a Material from the Group of the Monomers and Polymers of an Acyclic Terpene Having the General Formula $C_{10}H_{16}$.** A. L. Rummelsburg, assignor to Hercules Powder Co., both of Wilmington, Del.

2,378,447. **Plasticized Composition Including an Organic Substance and, as Plasticizer therefor, an Aliphatic Monobasic Acid Ester of an Alkyl Phenylethyl Alcohol.** F. J. Soday, Swarthmore, Pa., assignor to United Gas Improvement Co., a corporation of Pa.

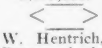
2,378,501. **Manufacturing Methyl Acrylate by Thermal Decomposition of Methyl Alpha-Acetoxypropionate.** W. P. Ratchford, Willow Grove, and C. H. Fisher, Abington, both in Pa., assignors to C. R. Wickard, as Secretary of Agriculture of the United States of America.

2,378,519. **Unvulcanized Butadiene-Styrene Elastomer in Which Is Incorporated a Zinc Salt of an Aromatic Mercaptan of the Benzene and Naphthalene Series.** J. R. Vincent, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,378,535. **Producing a Resinous Polymer from a Monomeric Ester of Vinyl Thiol Obtained by Pyrolyzing a Diester of 2-Mercaptoethanol.** M. M. Brubaker, Lindemere, assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,378,536. **Hydrolysis of a Polyvinyl Thiol Ester.** M. M. Brubaker, assignor to E. I. du Pont de Nemours & Co., Inc. both of Wilmington, Del.

2,378,551. **New Compound Having Formula:**

 $SO_2\ (CH_2CH_2O)_4\ CH_2CH_2OH$

W. Hentrich, Dessau-Rosslau, and W. Gundel, Dessau, both in Germany; vested in the Alien Property Custodian.

2,378,559. **Synthetic Elastomer Containing Sulphur Produced by Reacting Polysulphide Dissolved in an Aqueous Medium with a Dihalogenated Paraffin in the Presence of a Compound of Acyl Ester of Vinyl Alcohol with Unsubstituted Saturated Monocarboxylic Aliphatic Acid.** J. Kamlet, New York, N. Y., assignor to Miles Laboratories, Inc., Elkhart, Ind.

2,378,571. **Producing Polycondensation Substance from Hydrazine Dicarboxylic Diamide and Sebacic Acid Diamide.** O. Moldenhauer and H. Bock, both of Hirschberg, Germany; vested in the Alien Property Custodian.

2,378,573. **Mixture of Keto-Butanol 3.1 and 2 Methylene Keto-Butanol 3.1.** G. Natta, Milan, Italy; vested in the Alien Property Custodian.

2,378,575. **A Friction Element, the Binding Agent of Which Includes the Heat Reacted Mixture of a Castor Oil Modified Glycerol Phthalate and a Fusible Resin Prepared from a Mixture of Phenol, Aniline, and Formaldehyde Heated together.** A. J. Norton, Wells, Me., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,378,576. **Manufacturing Rubber-Like Materials by Mixing a Compound of the General Formula $[(HO)\ C_nH_{2n}]_2S_x$, Where n is between 1 and 6 and x is between 2 and 4, with an Inorganic Acid from the Group of Concentrated Sulphuric Acid, Phosphoric Acid, and Arsenic Acid.** T. Okita, Imazucho, Japan; vested in the Alien Property Custodian.

2,378,619. **Stabilized Plastic Composition Consisting of a Polyvinyl Acetal Resin and a Saturated Quaternary Ammonium Hydroxide.** T. S. Carswell, Longmeadow, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,378,629. **Interpolymerization Product of Maleic Anhydride and Ethylene.** W. E. Hanford, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,378,649-2,378,650. **Production of Butadiene.** W. J. Mattox, assignor to Universal Oil Products Co., both of Chicago, Ill.

2,378,667. **Composition Including a Fiber-Forming Synthetic Linear Polyamide and a Compatible Phenol-Formaldehyde Resin.** G. T. Vaala, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,378,674. **Thermoplastic Composition for Use as Saturant for Fibrous Material Which Includes a Solution Consisting of Rosin, Candelilla Wax, Cumar, Reclaim Rubber, Sulphur, and Antioxidant.** J. W. Wiley, Lancaster Township, assignor to Armstrong Cork Co., Lancaster, both in Pa.

2,378,693. **An Aqueous Polymer Dispersion of a Mixture of Butadiene-1,3 and a Monomer Copolymerizable therewith Coagulated by Means of an Aqueous Solution of an Ammonium Salt.** C. F. Fryling, Akron, O. assignor to B. F. Goodrich Co., New York, N. Y.

2,378,694. **Copolymerization of a Butadiene-1,3 Hydrocarbon and an Alpha-Methylene Nitrile in the Form of an Aqueous Emulsion in the Presence of Peroxynitric Acid Having the Formula HNO_4.** C. F. Fryling, assignor by mesne assignments to B. F. Goodrich Co., both of Akron, O.

2,378,695. **Coagulating Synthetic Rubber Latices.** C. F. Fryling, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,378,698. **Mono Benzyl Ether of Isobutenyl Hydroquinone Boiling at 165° to 172° C. at Three Mm. Pressure.** C. F. Gibbs, Cuyhoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,378,714. **Fireproofing Composition Including a Mixture of Thermally Unstable Chlorinated Resinous Organic Material, Zinc Carbonate, Monocalcium Chlorophosphate, a Wetting Agent, a Dispersion Medium and a Plasticizer Having Fire Retarding Properties.** M. Leatherman, Hyattsville, Md.

2,378,732. **Producing Synthetic Rubber from a Mixture of Butadiene and Acrylonitrile Polymerized in Aqueous Emulsion Containing a Fatty Acid Soap, Coagulating the Resulting Latex with Dilute Sulphuric Acid, and Extracting the Coagulated Synthetic Rubber with an Aqueous Solution of Sodium Hydroxide.** W. L. Semon and C. F. Fryling, Silver Lake, O., assignors to B. F. Goodrich Co., New York.

2,378,739. **Increasing the Dielectric Strength of Plasticized Polyvinyl Chloride Compositions by Incorporating therein Lead Silicate Dispersed in Water, Coagulated with a Member of the Class of Water-Soluble Compounds of Lead and Water-Soluble Compounds of Barium, and Dried.** G. H. Taft, Hudson, O., assignor to B. F. Goodrich Co., New York, N. Y.


BOOTS! BOOTS! BOOTS!
BETTER... MORE OF THEM

2,378,753. **Composition Including the Polymerization Product of a Vinyl Halide and a Polycarboxylic Acid Polyester of a Nuclearly Halogenated Aryl Ethyl Alcohol.** G. F. D'Alelio, Northampton, Mass., assignor to General Electric Co., a corporation of N. Y.

2,378,794. **Copolymerization Product of a Preformed Phenol-Aldehyde Resin and a Material from the Group of the Monomers and Polymers of Acyclic Terpenes Having Three Double Bonds per Molecule.** A. L. Rummelsburg, assignor to Hercules Powder Co., both of Wilmington, Del.

2,378,881. **Rubber Material Consisting of a Mixture Containing a Sulphur Vulcanizable Rubber and a Smaller Amount of Acenaphthylene.** F. E. Cislak, assignor to Reilly Tar & Chemical Corp., both of Indianapolis, Ind.

2,378,886. **Water-Resistant Alkyd Resin of Low Acid Number.** H. F. Weide, Los Angeles, Calif.

2,378,898. **An Organic Solvent-Soluble Cellulose Acetate Having Cellulosic Hydroxyl Hydrogen Replaced by a Radical R—S—CH_2—, Where R Is the Non-Mercapto Portion of an Organic Thiol.** W. J. Burke, Marshallton, assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, both in Del.

2,379,036. **Plastic Composition Including Cellulose Acetate and a Plasticizer Consisting of Material from the Group of p-Tertiary Alkyl Phenoxy Ethanols and p-Tertiary Alkyl Phenoxy Ethyl Acetates and a Solvent Plasticizer.** F. E. Piech, Sayreville, N. J., assignor to Hercules Powder Co., Wilmington, Del.

2,379,039. **Reaction Product of a Material from the Group of Primary and Secondary Amines Heated in the Presence of a Condensation Catalyst with a Diene Condensation Product Formed from One to Two Moles of an Acylic Terpene Having Three Double Bonds per Molecule with about Two to One Moles of Crotonaldehyde.** A. L. Rummelsburg, assignor to Hercules Powder Co., both of Wilmington, Del.

2,379,097. **Preparing γ Trihalobutyronitriles by Reacting a Haloform, X_3CH, Where X Is a Halogen from the Group of Chlorine and Bromine, with Acrylonitrile in the Presence of an Alkaline Condensing Agent.** W. Niederhauser and H. A. Bruson, assignors to Resinous Products & Chemical Co., all of Philadelphia, Pa.

2,379,104. **Manufacture of Lower Alkyl Esters of Alpha-Chloroacrylic Acid by the Interaction of Formaldehyde, Trichloroethylene, and a Lower Aliphatic Alcohol in the Presence of Sulphuric Acid.** A. M. Roberts, Widnes, England, assignor to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,379,218. **Preparing a Sheet of Resin by Placing a Liquid Mixture of an Ester and a Polymerization Catalyst in a Mold Consisting of Two Glass Plates Held Apart by an Elastic Edge Spacer, and Applying Heat and Pressure.** W. R. Dial and C. Gould, both of Akron, O., assignors to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

2,379,236. **Plasticizing Plastics.** J. D. Jenkins, Wilkinsburg, assignor to Pittsburgh Plate Glass Co., Pittsburgh, both in Pa.

2,379,237. **Fine Pigmented Powders of Organic Plastics.** J. D. Jenkins, Forest Hills, assignor to Pittsburgh Plate Glass Co., Pittsburgh, both in Pa.

2,379,247-2,379,248. **Shaped Sheets of Polymeric Material.** I. E. Muskat, Akron, O., assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

2,379,268. **In Preparing a Diolefin Polymerizate, the Step of Stripping Unreacted Olefinic Components from the Aqueous Emulsion Polymerizate Mixtures by Volatilization in the Presence of an Ester Wax Substantially Water Insoluble.** J. C. Zimmer, Union, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,379,292. **Copolymerization of Vinyl Halide and Isoolefin.** A. H. Gleason, Westfield, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,379,297. **Polymerizate of an Alpha-beta-Ethylenically Unsaturated Aliphatic Carboxylic Acid Ester of an Alpha-Cyanoalcohol with a Polymerizable Conjugated Butadiene.** J. Harmon and C. J. Mighton, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,379,318. **In a High-Frequency Transmission Line, an Insulation Compounded of Polymerized Isobutylene, Cyclized Rubber, Zinc Stearate, and a Small Amount of Paraffin Wax.** M. M. Safford, assignor to General Electric Co., both of Schenectady, N. Y.

2,379,345. **Manufacture of Oil-Resisting Rubbers by Reacting Rubber with a Reagent from the Class of Lead Tetracetate and Tetrabenzoate and Then Preparing Hydroxylated Rubbers from These Derivatives by Boiling with Caustic Soda.** E. H. Farmer, Radlett, assignor to British Rubber Producers' Research Association, London, both in England.

2,379,354. **Reaction Products Produced from a Solution of Rubber Made with the Aid of Aromatic Hydrocarbon Solvent, by Adding to the Solution Allyl Chloride and Reacting This Mixture with Sulphur Dioxide in the Presence of Lithium Nitrate as a Catalyst to Produce an Intimate Mixture of Rubber Sulphones.** F. Hilton, Welwyn Garden City, assignor to British Rubber Producers' Research Association, London, both in England.

2,379,375. **Synthetic Resins Produced from a Mixture of Oxidized Rubber and Maleic Anhydride, to Which Oxalic Acid, as a Catalyst, and Phenol Have Been Added, the Whole Heated in the Presence of Oxidizing Gas and Then Reacted with Formaldehyde.** F. J. W. Popham, New Barnet, assignor to British Rubber Producers' Research Association, London, both in England.

2,379,389. **Composition Including a Butadiene Rubber Material in Which Is Incorporated a Sticky, Substantially Non-Oxidizable, Flame Resisting Vegetable Resin from the Group of Cativo Resin and Copaiba Resin.** N. E. Tillotson, Watertown, Mass.

Dominion of Canada

427,800. **Insulating Composition Consisting of Halogenated Diphenyl Benzene and Halogenated Ortho Diphenyl.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of F. M. Clark, Pittsfield, Mass., U. S. A.

427,801. **Dielectric Composition for Use in Electric Capacitors, Consisting of Diphenyl Benzene, Diphenyl, and a Condensed Polynuclear Hydrocarbon.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of F. M. Clark, Pittsfield, Mass., U. S. A.

427,803. **Softened Polyvinyl Acetal Pellicle Including Carboxylic Acid Di-Ester of Octadecanediol Softener.** Canadian Industries, Ltd., Montreal, P. Q., assignee of E. F. Izard, Kenmore, N. Y., U. S. A.

427,809. **Incorporating a Finely Divided Solid Pigment in a Molten Synthetic Linear Polyamide.** Canadian Industries, Ltd., Montreal, P. Q., assignee of G. De W. Graves, Wilmington, Del., U. S. A.

427,811. **Alpha-Aryl-Acrylonitrile.** Canadian Industries, Ltd., Montreal, P. Q., assignee of V. M. Weinmayr, Pitman, N. J., U. S. A.

427,812. **Curable Neoprene Composition Containing Uncured Chloroprene Polymer Obtained by Polymerizing Chloroprene in the Presence of Elementary Sulphur and an Accelerator Including Litharge, and a Butyraldehydeamine.** Canadian Industries, Ltd., Montreal, P. Q., assignee of L. S. Bake, Pennsgrove, N. J., U.S.A.

427,813. **Elastic, Rubber-Like Article from a Composition of a Homogeneous Mixture of a Partial Ester of Polyvinyl Alcohol Wherein 15 to 65% of the Hydroxyl Groups Are Esterified and a Tetraethylene Glycol Containing Four to 20 Carbon Atoms.** Canadian Industries, Ltd., Montreal, P. Q., assignee of H. M. Sonnichsen, Niagara Falls, N. Y., U. S. A.

427,832. **Rubber Hydrochloride Composition Containing a Trialkyl Trimethylene Triamine.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of G. E. Hulse, Jr., Passaic, N. J., U. S. A.

427,833. **Process Including Mixing Rubber with a Rubber Reenforcing Black and an Aromatic Nitroso Compound Incapable of Exhibiting Tautomerism, and thereafter Heating and Masticating the Mix and Completing Incorporation of Additional Ingredients.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of L. H. Howland, Cheshire, Conn., U. S. A.

427,834. **Producing Gas-Expanded Rubber with the Aid of Thermal Decomposition Products of Zinc Diammonia Nitrite Liberated within the Rubber.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. V. Smith, Nutley, N. J., U. S. A.

427,835. **Preserving Rubber with the Aid of a Product of Thermal Reaction of a Ketone, a Hydrocarbon Alcohol, and a Secondary Di-Aromatic Amine in the Presence of an Acidic Catalyst with Elimination of Water.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of P. T. Paul, Naugatuck, Conn., U. S. A.

427,838. **Goods of Rubber-Like Material Obtained from Aqueous Dispersions of Rubber or Similar Material Including a Salt of Hydrofluosilicic Acid and a Non-Coagulating Salt Which Dissolves in Water to Give a Neutral Solution and Which Reduces the Rate of Formation of the Hydrolytic Products from the Salt of Hydrofluosilicic Acid.** Dunlop Rubber Co., Ltd., London, assignee of D. F. Twiss and P. H. Amphlett, both of Birmingham, both in England.

427,898. **Rubber Compounding Process Which Includes Mixing Rubber with Carbon Black and a Small Amount of a Di(primary) Amine.** United States Rubber Co., New York, N. Y., assignee of L. H. Howland, Cheshire, Conn., both in the U. S. A.

427,899. **Sponge from a Latex Foam.** United States Rubber Co., New York, assignee of S. R. Ogilby, Eltingville, S. I., both in N. Y., U.S.A.

428,044. **Films and Sheets Impermeable to Ultra-Violet Radiations, Having a Base of Plastic Material.** C. Dreyfus, New York, N. Y., assignee of W. Horback, Newark, N. J., U. S. A.

428,097. **Dielectric Compositions Including Diphenyl Benzene and Hydrogenated Castor Oil.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of F. M. Clark, Pittsfield, Mass., U. S. A.

428,098-428,099. **Resinous Compositions.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio and J. W. Underwood, both of Pittsfield, Mass., U. S. A.

428,117. **Stabilized Liquid Coating Composition Including a Dispersion in Aqueous Ammonia of a Conjoint Polymer of a Vinyl Compound of the Group of Styrene, Vinyl Acetate, and Vinyl Chloride with a Compound of the Group of Maleic Anhydride and Maleic Acid, and a Higher Polyalkylene Glycol.** Carbide & Carbon Chemicals, Ltd., Toronto, Ont., assignee of W. N. Stoops and W. A. Denison, both of South Charleston, W. Va., U. S. A.

428,127. **Thermoplastic Adhesive Composition.** Dow Chemical Co., Midland, Mich., assignee of C. F. Cummins, Chicago, Ill., and K. D. Bacon, Midland, Mich., U. S. A.

428,168. **Reducing Local Coagulation of an Alkaline Latex on Addition of a Fluosilicate, by Mixing the Fluosilicate Suspended in an Aqueous Medium Containing Added Fluoride Ions.** United States Rubber Co., New York, N. Y., assignee of R. H. Ewart, Nutley, N. J., both in the U. S. A.

428,169. **Making Sponge Rubber from a Latex Foam Prepared by Adding to Latex Material from the Group of Tannic Acid, Tannin, Gallatonic Acid, and Digalic Acid.** United States Rubber Co., New York, N. Y., assignee of R. O. Borton, Cambridge, Mass., both in the U. S. A.

428,291. **Improved Bonded Fibrous Materials Obtained by Impregnating Fibrous Material in the Form of Loose Fibers with a Solution or Dispersion of an Aldehyde Condensation Product of Low Molecular Weight.** Tootal Broadhurst Lee Co., Ltd., Manchester, Lancaster, assignee of E. R. Angel, Beaconsfield, Buckinghamshire, both in England.

United Kingdom

568,688. **Polyamide Products.** E. I. du Pont de Nemours & Co., Inc.

568,709. **Plastic or Elastic Compositions.** Monsanto Chemical Co.

568,723. **Treatment of Rubber.** Monsanto Chemical Co.

568,725. **Condensation of Olefin Sulphonic Acids with Aromatic Compounds.** W. P. Williams (Proctor & Gamble Co.).

568,787. **Cyclized Rubber.** Wingfoot Corp.

568,818. **Diolefins.** Standard Oil Development Co.

568,850. **Guanidine Derivatives.** S. Birtwell, C. H. Vasey, and Imperial Chemical Industries, Ltd.

568,858. **Cumarin Derivative.** Hoffman-La Roche & Co., A.G.

568,884. **Emulsion Polymerization Products.** Shawinigan Chemicals, Ltd.

568,885. **Polymerization of Vinyl Esters.** Shawinigan Chemicals, Ltd.

568,886. **Polymerization of Vinyl Esters in Emulsion.** Shawinigan Chemicals, Ltd.

568,914. **Polyvinyl Acetal Resins.** E. I. du Pont de Nemours & Co., Inc.

568,941. **Aliphatic Dinitriles.** E. I. du Pont de Nemours & Co., Inc.

568,964. **Synthetic Rubber-Like Materials.** E. I. du Pont de Nemours & Co., Inc., and C. J. Mighton.

568,977. **Polyamide Compositions.** E. I. du Pont de Nemours & Co., Inc.

MACHINERY

United States

2,376,980. **Spray Coating Machine.** J. S. Petersen, Burlington, Iowa, and J. W. Miller, Toledo, H. L. Wendshuh, Maumee, and B. H. Moser, assignor to De Vilbiss Co., both in Toledo, both in O.

2,377,016. **Apparatus for Uniting a Body of Plastic Material to an Adjoining Body of Yieldable Material.** C. E. Leguillon and H. L. Young, both in Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,377,177. **Gassing Chamber for Treating Materials under High Gas Pressure, Having a Corrugated Metallic Wall and Internal Heating Elements, and between Wall and Heating Elements a Thermally Reflective Surface.** H. Pfleumer, New Brunswick, N. J., assignor to Rubatex Products, Inc., New York, N. Y.

2,377,590. **Apparatus for Testing Hardness and Related Properties of Elastic and Plastic Materials.** J. A. Talalay, Boston, assignor to Converse Rubber Co., Malden, both in Mass.

2,377,615. **Apparatus for Providing a Plastic Lining for Conduits.** H. R. Crane, Los Angeles, Calif.

2,377,637. **Machine to Coat Fabrics.** J. Lloyd, Pendleton, Salford 6, assignor to J.

Mandleberg & Co., Ltd., Pendleton, Lancaster, both in England.

2,378,237. **Apparatus for Detecting Separations or Breaks in a Rubber or Rubber and Fabric Article with the Aid of High-Frequency Sound Waves.** W. E. Morris, assignor to Wingfoot Corp., both of Akron, O.

2,378,336. **Machine for Everting Ball Casings and the Like.** R. A. Sopp, assignor to Rawlings Mfg. Co., both of St. Louis, Mo.

2,377,946. **Apparatus for Shaping Thermoplastic Sheets.** R. E. Leary, Newark, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,377,962. **Device to Cement together a Pair of Curved Mating Parts of Plastic Material.** P. F. Preston, Newark, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,377,979. **Apparatus for Applying to the Surface of a Series of Flat Articles a Continuous Web of Flexible Sheet Material Including a Substance Which Becomes Tacky When Heated.** J. F. Strable, Strood, assignor to Gyproc Products, Ltd., London, both in England.

2,378,011. **Device to Stretch an Elastic Covering about a Curved Surface.** V. H. Hasselquist, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

Dominion of Canada

426,895. **Combination Tire Molding and Stripping Press.** McNeil Machine & Engineering Co., assignee of L. E. Soderquist, both of Akron, O., U. S. A.

426,896. **Tire Press, Combining Means for Shaping a Tire and Vulcanizing and Removing It.** McNeil Machine & Engineering Co., assignee of L. E. Soderquist, both of Akron, O., U. S. A.

427,247. **Molding Apparatus.** United States Rubber Co., New York, N. Y., assignee of E. A. Luxenberger, G. W. Blair, and J. F. Schott, all of Mishawaka, Ind., U. S. A.

427,258. **Mold for Sponge Rubber.** Wingfoot Corp., assignee of C. F. Sudman, both of Akron, O., U. S. A.

427,868. **Apparatus for Shaping Solvent-Free Organic Plastic Material by Extrusion.** Plax Corp., Hartford, assignor of J. Bailey, West Hartford, and R. S. Jesionowski, Hartford, both in Conn., U. S. A.

427,869. **Apparatus for Molding Plastic Material.** Plax Corp., Hartford, assignee of J. Bailey, West Hartford, both in Conn., U. S. A.

428,049. **Tire Tube Tester.** J. G. Alexander, Arborg, Man.

428,227. **Apparatus to Form Bonded Thermoplastic Sheet Material.** American Felt Co., Glenville, assignor of H. Roeddinghaus, Greenwich, both in Conn., U. S. A.

United Kingdom

567,632. **Strip Cutter.** Dunlop Rubber Co., Ltd., H. Smith, J. W. Wilcox, and G. H. B. Yoxon.

567,804. **Automatic Electric Vulcanizers.** J. and J. C. Lenegan.

567,805. **Apparatus for Molding Thermoplastic Materials.** Callender's Cable & Construction Co., Ltd., and A. B. F. G. Richardson.

567,812. **Nozzles and Appurtenances therefor.** Dunlop Rubber Co., Ltd., J. D. Crabbe, and J. K. Bradshaw.

567,956. **Apparatus for Vulcanizing and Other Heat-Treatment of Electric Cables.** W. T. Henley's Telegraph Works Co., Ltd., and J. H. Savage.

568,050. **Injection Molding Machine.** W. R. Tucker.

568,127. **Molds for Curing Pneumatic Tires and Other Inflatable Articles of Rubber.** Dill Mfg. Co.

568,184. **Mold for Molding Articles of Rubber and Other Thermoplastic and Thermosetting Materials.** C. T. Gould.

568,766. **Apparatus for Impregnating Articles and Materials with Liquid.** British Insulated Cables, Ltd., T. Broadbent & Sons, Ltd., and F. Broadbent.

569,326. **Die Casting, Injection Molding Machines, Etc.** E. M. B. Co., Ltd., and L. A. Catlin.

UNCLASSIFIED

United States

2,374,748. **Tire Pressure Alarm.** A. M. Heath, Houston, Tex.

2,375,171. **Inner Tube Balancer.** J. Torrey, assignor to Wingfoot Corp., both of Akron, O.

2,376,244. **Cellulose Coated Plaster Mold for the Preparation of a Synthetic Resinous Object by the Polymerization of a Resinous Liquid.** R. D. Freeman, Midland, Mich., and G. P. Schmelter, Plainfield, N. J., assignors to Dow Chemical Co., Midland, Mich.

2,376,773. **Tire Cord Inspecting Reel.** C. A. Hogan, Cedartown, Ga.

2,377,010. **Hose Coupling.** G. G. Howard, assignor to Scovill Mfg. Co., both of Waterbury, Conn.

2,377,149. **Combined Spare Tire Carrier and Tire-Handling Hoist.** H. G. Heil, Middletown, N. Y.

2,378,367. **Apparatus for Inflating and Deflating an Inflatable Plug within a Conduit by Means of a Water Content.** E. T. Ahern, New Haven, Conn.; I. D. Ahern, administratrix of E. T. Ahern, deceased.

2,378,384. **Tire Valve.** K. V. Baker, Malaga, O.

2,378,911. **Auxiliary Wheel and Tire Carrier.** K. C. Clark, Watsonville, Calif.

2,378,955. **Tire Tool.** O. V. Teegarden, Goshen, Ind.

Dominion of Canada

426,880. **Hose Handling Apparatus.** Gilbert & Barker Mfg. Co., West Springfield, assignee of A. L. Grise, Springfield, both in Mass., U. S. A.

426,913. **Belt Splicing Mechanism.** Chas. A. Schrieren Co., assignee of G. A. Schieren, both of New York, N. Y., U. S. A.

426,928. **Constructing a Cord for Use in Tire Casings.** Hampton Co., Easthampton, Mass., and United States Rubber Co., New York, N. Y., assignees of Fisk Rubber Corp., Chicopee Falls, and Hampton Co., assignees of A. W. Hansen, Springfield, and W. F. Guinan, Northampton, all in Mass., both in the U. S. A.

427,123. **Set of Curved Spud Plates for Application to the Tread of a Pneumatic Tire, Especially for Use on a Tractor Wheel.** S. V. Bradney, Netherton, Worcester, England.

427,463. **Hose Clamp.** Griplock of Canada, Ltd., Toronto, assignees of H. Embree, Hamilton, both in Ont.

427,569. **Elastic Filament Winder.** Filatex Corp., New York, N. Y., assignee of C. Ribavaro, Trenton, N. J., both in the U. S. A.

427,702. **Hose Clamp.** Tinnerman Products, Inc., assignee of R. A. Hartman, both of Cleveland, O., U. S. A.

427,751. **Wheel Structure.** G. A. Lyon, Allenhurst, N. Y., U. S. A.

427,820. **Hose Clamp.** Central Equipment Co., assignee of R. Krasberg & Sons Mfg. Co., assignee of C. F. Black, all of Chicago, Ill., U. S. A.

428,206. **Hose Clamping Device.** E. Longden, Johannesburg, Transvaal, South Africa.

United Kingdom

567,562. **Vehicle Wheels.** Dunlop Rubber Co., Ltd., and H. J. Butler.

568,045. **Means for Connecting the Ends of Power Transmission Belts of Circular Cross-Section.** C. D. Riddick.

568,078. **Anti-Adhesion Fluids for Penetrating and Reducing Rubber-to-Metal Adhesions.** T. R. Parry.

568,174. **Parasiticidal Preparations.** United States Rubber Co.

568,330. **Pressure Gages for Pneumatic Tires.** H. Turner and T. Brown.

568,482. **Foot-Operated Inflators for Tires, Etc.** W. Turner.

568,596. **Electric Cable Couplings.** A. D. Ferguson, F. J. Hammelberg, and Metropolitan-Vickers Electrical Co., Ltd.

568,643. **Electric Cable Joints.** Standard Telephones & Cables, Ltd., and R. E. Seymour.

569,250. **Couplings for Hose and Pipes.** Tecalemit, Ltd., and C. C. S. Le Clair.

TRADE MARKS

United States

412,417. **Tube-Lube.** Tire talc. H. M. Smith, doing business as Tube-Lube Co., Chattanooga, Tenn.

412,435. **Imperial.** Elastic webbing. McCoy, Jones & Co., Inc., Chicago, Ill.

412,436. **Regal.** Elastic webbing. McCoy, Jones & Co., Inc., Chicago, Ill.

412,459. **Ray-Unite.** Clutch facing and brake lining. Raybestos-Manhattan, Inc., Passaic, N. J.

412,461. **Acme.** Elastic bandages, syringes, etc. Becton, Dickinson & Co., Rutherford, N. J.

412,463. **Para-Plastic.** Expansion joint sealing compounds, fillers, waterproofing cements, and chemical waterproofing compounds for construction materials. Servicised Products Corp., Chicago, Ill.

412,533. Representation of a cross with a maid in the center and the words: **"Milady's Maid,"** on either side. Laundry device. P. Woodson, San Francisco, Calif.

412,542. **Post War Last.** Footwear. Tupper Shoes, Inc., New York, N. Y.

412,590. **Sheila Dorr.** Raincoats and other wearing apparel. Imperial Hosiery Co., Pittsburgh, Pa.

OBITUARY

Frederick C. Renner

FREDERICK C. RENNER, general manager of sales of the organic chemicals division, Monsanto Chemical Co., St. Louis, Mo., died of heart disease in a St. Louis hospital on June 26 after a long illness.

A native of Pirmasens, Germany, where he was born 44 years ago, Mr. Renner immigrated to this country with his parents as a boy. He attended public schools of St. Louis and Washington University, from which he received a B.S. degree in 1922.

He taught one year at Washington University and in 1924 joined Monsanto's St. Louis sales staff. Mr. Renner was assistant branch manager of the Chicago office, 1928 and 1929, and for the next ten years served as assistant sales manager of Monsanto's Merrimac division at Everett, Mass. In 1939 and 1940 the deceased served as assistant general branch manager of Monsanto's New York office, and in 1941 and 1942 as assistant general sales manager of the organic chemicals division, with headquarters at St. Louis. He became general manager of sales of the division in 1943.

He was a Mason and a member of the University and the Bellerive Country clubs, Sigma Xi, and Alpha Chi Sigma.

Surviving are his wife, a daughter, and a son.

Herbert J. Winn

ON JUNE 27, Herbert J. Winn, chairman of the board of Taylor Instrument Cos., Rochester, N. Y., died unexpectedly at his home there. He would have been 75 on July 12.

Mr. Winn began his career with the company in 1893, starting as a "boy of all work." In 1898 he was sent to London to open a branch office and during his six years there purchased Short & Mason Co., Ltd. Upon his return to this country a large share of the responsibility for managing the office end of the business was placed on his shoulders. In 1933, upon the death of J. Merton Taylor, Mr. Winn was elected president of the Taylor company, a position he held until 1938, when he was made chairman of the board.

Mr. Winn's activities outside the business were legion. At various times he was chairman of the board of directors of the Lincoln-Alliance Bank & Trust Co., a director of the Pfaudler Co., and a trustee of the Rochester Trust & Safe Deposit Co., the Community Chest, and the Rochester Savings Bank. He was also president and treasurer of the Rochester Printing Co.

Harry B. McGown

FORMER secretary of St. Joseph Lead Co., 250 Park Ave., New York, N. Y., Harry B. McGown, died July 1. Mr. McGown joined the company January 4, 1904, and later became secretary, remaining in that capacity until his retirement December 1, 1940.

He had been a member of the Masons and of the Sons of the American Revolution.

He was born July 29, 1875.

The funeral took place July 4 in Rutherford, N. J. Burial was the next day.

He leaves a wife and three children.

New Goods and Specialties

Synthetic Rubber Gloves

Ipco "Whale-Hide" Gloves

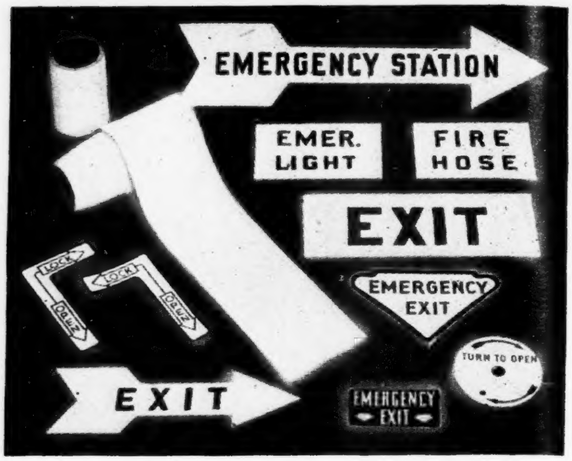
IPCO "Whale-Hide" synthetic rubber gloves are reported to be made from a newly developed compound which provides exceptional flexibility as well as resistance to oils, solvents, and other chemicals and to abrasion, snagging, puncturing, and aging. The curved-finger design conforms to the natural shape of the hand and eliminates tightness and binding. They are made in a wide assortment of weights, lengths, and sizes for men and women for fine work and heavy-duty use. Industrial Products Co.

Rubber Coated Fiberglas Insulated Wire

FIBERGLAS "inner braid" cable has been adopted as standard for aircraft ignition cable by the Army and Navy Air Corps because it has given exceptional service under conditions of high altitude and high voltage. One type of Fiberglas insulated wire which has been successful employs a tinned, stranded conductor, over which is placed an extrusion of highest grade natural or synthetic rubber. A strong open braid of Fiberglas yarns coated with a sealer is placed over the principal dielectric, and a sheath of neoprene is then extruded to form the exterior coating. Sealing tape and conduit boxes of neoprene coated Fiberglas cloth are also in use by the Navy.

Phosphorescent Tape

CONTI-GLO PLASTIC TAPE, 61P90, acts as a source for the storage of light and gives off this light in the darkness for many hours afterward in direct proportion to the amount and intensity of light which it has previously received. The tape is said to be stable under adverse weather conditions and resistant to moisture, acid, alkali, grease, oil, dirt, heat, and abrasion. It is of a three-ply combination consisting of a layer of phosphorescent pigment between a white adhesive on one side and a clear plastic protective film on the other side. This synthetic adhesive makes it possible to attach the tape to any type of surface, if cleaned and perfectly dry. Some advantages claimed are: increased brightness, increased stability for weather exposure, increased shelf life, increased adhesive bond with age, superior surface smoothness and appearance, resistance to most



Some Uses of Conti-Glo Plastic Tape

harmful agents, and ease of application. Continental Lithograph Corp.

New Type of Tourniquet

As a result of many unsuccessful post-operative conditions in the first World War, a surgeon developed a new type of tourniquet to replace the conventional type, which was the cause of post-operative gangrene. The "Conn Type Pneumatic Tourniquet" halts the flow of blood in amputations, bone grafts, and other cases which involve extremities, but the danger of breaking blood vessel walls or paralyzing important nerves is virtually eliminated.

Harold R. Conn, medical director of the Goodyear Tire & Rubber Co., Akron, O., and a recognized authority on orthopedic surgery, developed this tourniquet, which consists of an inflatable rubberized fabric tube reenforced on the outside by a longer rubberized fabric belt. A buckle permits the outside belt to be adjusted thereby providing for any desired tightness of the deflated tube. Air is pumped into the tube by a hand-bulb at the end of a four-foot length of rubber hose. Proper pressures for inflation are indicated by a gage. Absolutely correct pressure is impossible with the conventional type of tourniquet, but even unskilled operators can apply correct pressure with the Conn tourniquet according to gage readings. Pressure reduction is accomplished by means of a valve on the tourniquet, an important fact in operations lasting more than 30 or 40 minutes as the danger of gangrene rises in direct proportion to the length of time the blood supply is curtailed. The tourniquet can be sterilized in boiling water without damage to it. It is being produced in Goodyear's Akron plants for Army and Navy hospitals. Individually packed in metal cases, the tourniquet is disassembled to lessen damage from rough handling. It is mounted inside the case on molded rubber bases. The tourniquet weighs six pounds.

New Synthetics in Sweden

Among the new materials being manufactured in Sweden is melamine, produced by the Stockholm Superfosfat Fabriks A/B at its Ljungaverk plant. Melamine and formaldehyde are combined to form a resinous material called Mepal, used in the manufacture of glues and plastics. Melamine-based adhesive is said to be useful for various purposes in the plywood and woodworking industries. In addition to melamine adhesives, those based on phenolformaldehyde and urea or carbamide are also used for the same purpose.

Among the synthetic materials now produced in Sweden mention should also be made of synthetic rubber. During the current year two state-owned synthetic rubber plants at Stockvik are expected to be completed. Besides experiments are under way to perfect the process for making neoprene in the factory at Ljungaverken. Synthetic rubber imported from the United States also began to make its appearance toward the end of 1944, and the Swedish branch of a United States rubber concern has begun to make synthetic rubber tires—a very welcome development in view of the serious shortage of tires here.

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LATIN AMERICA

Guayule in Latin America

In a recent issue of *Agriculture in the Americas*, Loren G. Polhamus reviews the work done so far on the cultivation of guayule in Latin America. About six months before Pearl Harbor a bill was introduced in Congress providing for the planting of 45,000 acres of guayule in the United States. A second bill, amended to allow plantings anywhere in the Western Hemisphere, was passed early in 1942 and empowered the Secretary of Agriculture to carry out the program. Whereupon the U. S. Forest Service was given the responsibility for the administration of the program with authority to call for necessary services on various bureaus, including the Bureau of Plant Industry, Soils, and Agricultural Engineering. The work of this bureau was divided into two parts: one, under A. C. Hildreth, undertook basic research on all phases of guayule cultivation in the United States, and the second, under E. Brandes, had, in coordination with other rubber investigations in Latin America, the task of determining those areas outside the United States suitable for guayule cultivation.

In the Spring of 1942, the first planting of guayule in Latin America under this project was made at Gomez Palacio, Durango, Mexico, on land selected in consultation with representatives of the Mexican Department of Agriculture. Later in the same year H. H. Bartlett, of the University of Michigan, was put in charge of the preliminary phases of the Latin American guayule project, and after a brief study and conference period in Salinas, Calif., where guayule was already in cultivation, Dr. Bartlett spent 18 months in Chile, Argentina, Uruguay, and Mexico determining where natural conditions seemed most favorable for the growth of guayule and assisting in establishing guayule nurseries.

The project brought many problems with it. For commercial production of cultivated plants for rubber extraction, the growth period must be reduced to a minimum, and in the United States this was achieved by means of intensive agricultural practices, especially irrigation. However even in the United States the use of irrigated land for the cultivation of guayule seemingly brought the rubber program into competition with food production, and in Latin America the chances of this competition would be much more intense and real. Consequently much more careful investigation of soil conditions and rainfall in different countries was necessary than might otherwise have been the case. Eventually suitable areas were found in Mexico in the high fertile grassland areas of the States of Durango and Zacatecas and in the States of San Luis Potosi, Guanajuato, and Nuevo Leon; and in similar areas in Chile, Uruguay and Argentina.

Nurseries were established at Payne in Chile, Salta, Catamarca, San Juan, and Mendoza, in Argentina, and at La Estanzuela in Uruguay. In Mexico first reliance was placed on seedlings from Salinas, but later a nursery was established at El Mante and a second at Saltillo; but still later, nursery work was discontinued in Mexico, and arrangements were made to obtain plants from a private company in Torreon.

Field test plantings were started in various parts of Mexico, some in cooperation with private companies, and the rest on land supplied by the Mexican Department of Agriculture.

In all, a good start has been made in laying the foundations for an economical cultivation of guayule in Latin America, but what the future success of this type of rubber will be is as yet unforeseeable. However it is held a certainty that guayule must be considered as a definite factor in the postwar potential source of rubber.

COLOMBIA

Recent reports from Washington as well as from the Latin-American countries give a good picture of the work on rubber development carried out by the United States in cooperation with various South American countries. It was in 1940 that the United States decided, with the enthusiastic cooperation of the rubber-growing countries to the south, to make a survey of the possibilities for cultivating rubber in suitable areas, and Colombia was one of the first countries visited.

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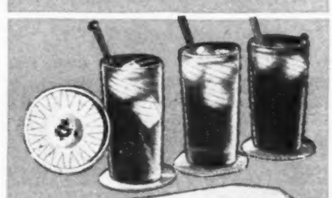

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BUY MORE WAR BONDS . . . AND KEEP THEM!

As a result of the investigations of two groups of trained personnel from the United States Department of Agriculture and the Department of Agriculture of Colombia, it was found that the Uraba region of the Department of Antioquia offered the best advantages for rubber cultivation in Colombia, as it possesses large areas of good virgin land, and the Inter-American Highway, to be completed by 1947, will pass through it from one end to the other. In January, 1941, an agreement was signed by representatives of Colombia and the United States providing for the establishment of nursery plantings, and with the aid of two Columbian agronomists, Luis Arenas and Juan Giraldo, three nurseries were started, one at Acandi, one at Turbo River, and one at Apartado. In 1942 the program was expanded to include the establishment of three demonstration plantations with a total area of 3,000 to 3,700 acres, and two more nurseries were started, one at Riogrande and the other at Villa Arteaga. It was estimated that by 1944 enough material would have been propagated to permit planting up 1,200 acres during the year. But though 1,250 acres of land were cleared of virgin forest by November, 1944, bridges, drainage, and 37 miles of roads between the 10-acre lots had been completed, and lining and holing had been carried out on 825 acres, only 300 acres could actually be planted up to that time. Enough material had been budded for 740 acres of planting, but leaf blight so seriously attacked nursery seedlings that despite all efforts to check the disease, the percentage of success was reduced to only 22% of the total.

Fortunately for the project, 100,000 seedlings established at Villa Arteaga in 1943 from seed obtained in the Leticia region in Colombia, where *Hevea brasiliensis* grows wild, showed unusual resistance to leaf blight. Resistant seed obtained from other parts of the Amazon Valley, as the Acre Territory, usually show a certain percentage of infected seedlings, but not a single plant of the Leticia material has so far lost its leaves on account of the disease.

During 1944, about 42,000 additional seedlings were obtained from Leticia, and the program for 1945 includes obtaining 350,000 more seeds to complete the 3,000 acres at Acandi, Turbo, Riogrande, and Villa Arteaga. Under present plans these plantations will serve as demonstration centers for later colonization schemes.

There has been a gratifying increase in the amount of available budwood; in the 1944 budding season, only 5,000 clonal plants were available, against at least 20,000 in the 1945 season, an amount considered sufficient for all the resistant rootstock at present on hand.

For the most part selected Far Eastern clones have been used as planting material, but for top-work and also for planting intermingled with the imported clones, some resistant Ford clones have also been propagated.

Experiments with *Hevea spruceana* as rootstock have not been very favorable in Colombia; the main difficulty seems to be the slow development of the buds on this stock. Consequently budding on these stocks has been discontinued; however, since it has been reported from the Far East that hybrid stock of *Hevea brasiliensis* crossed with *H. spruceana* yields 15 to 32% more than *H. brasiliensis* rootstock, it has been decided to plant one block of about 10 acres with 50% *H. spruceana* stumps and 50% resistant Ford material in order to obtain a supply of hybrid seed which it is hoped will provide valuable materials for future plantings in Colombia.

PERU

The year 1944 saw an improvement in the tire situation for Peru, thanks to more general efforts at tire conservation, but chiefly to the production of enough camelback for all retreads and most important of all—the production locally of a sufficiently large number of tires to cover the greater part of the country's essential tire requirements. This last development seems to be owing to the activities of the Peruvian subsidiary of a United States tire factory which began operations in September, 1943. To the end of 1943 the factory in Peru made 4,419 truck tires and 3,371 passenger car tires in addition to 2,624 inner tubes. For 1944 the output included 13,900 truck tires, 12,600 passenger car tires, and 16,500 inner tubes. Results for 1945 are expected to be even better, once additional molds and other equipment which have already been ordered arrive from the United States.

Early last month formal inauguration took place of the new Agricultural Experimental Station at Tingo Maria, Peru. This station, planned in 1942, has numerous projects under way including besides studies on cinchona and other important crops,

research on rubber, the establishment of rubber nurseries, and demonstration of rubber planting. Charles C. Concannon, chief of the Chemical Unit of the Bureau of Foreign and Domestic Commerce, represented Secretary Wallace and the United States Department of Commerce at the ceremonies. In the course of his speech Mr. Concannon pointed to the colonization of the Tingo Maria region as an event of major importance in the economic annals of the Andean area. It demonstrated the possibility of economic conquest of the Andes and promised the eventual integration of the vast interior into the economy and culture of Peru and through it into that of the world. The Experimental Station at Tingo Maria was projected at a time when the world was in mortal danger, he said, and the varied resources of Tingo Maria were placed at the services of the United Nations. The war in Europe was now ended, but the United Nations continued to rely on Tingo Maria for those strategic materials which it was able to provide. The Experimental Station at Tingo Maria was a cooperative enterprise of the governments and peoples of the United States and Peru, Mr. Concannon stressed, and both nations recognized the importance of the success of the undertaking as a contribution to the economic expansion and economic well-being of Peru, hence as a factor in strengthening the foundations of the Inter-American system, and thereby helping to render peace and prosperity throughout the world more secure.

ARGENTINA

Argentina's most urgent tire and rubber needs will soon be met by the release of a certain amount of rubber which is expected to arrive from Brazil shortly. The two Latin American republics and the United States, it is officially announced, signed the necessary rubber agreement in the beginning of last May. The shortage of rubber and rubber tires in Argentina challenged the ingenuity of the population, and various expedients were resorted to in the effort to save or replace rubber. Among the tire conservation methods devised were leather straps to go around the tire and perforated metal tires. A wooden, sectional tire for which a mileage of about 5,300 on level or macadam roads was claimed, apparently found some demand, for limited quantities have been manufactured by a Buenos Aires firm.

Because she has been unable to import adequate supplies of crude rubber in the past few years, Argentina considered the possibilities of producing synthetic rubber and of cultivating suitable rubber-bearing plants. But so far progress does not appear to have advanced beyond experimental work, and in order to meet essential demands for rubber goods, the country's already very meager stocks of crude rubber have had to be touched. In 1944 total crude rubber consumption was reported at 760 tons, of which only 258 tons could be imported in the first ten months of the year; the remainder was taken from stocks. Besides about 5,400 tons of reclaimed rubber were used during the year. Most of the crude went into the production of tires and tubes; while the greater part of the reclaim was used, for all other goods. Total number of tires and tubes needed in 1944 was 100,000 tires and 55,000 tubes, but only 72,000 tires and 46,800 tubes could be produced during the year; the rest of the requirements had to be drawn from reserves.

Because of the large amount of reclaimed rubber used, the quality of the scrap is constantly deteriorating so that increasingly larger proportions of crude rubber must be used in the manufacture of rubber articles, factors which naturally further tend to limit domestic production.

In 1944 the consumption of articles as belting, hose, and footwear totaled about 1,500 tons, of which about 650 tons were imported.

ECUADOR

Ecuador is one of the Latin American countries which have been counted on to contribute a relatively substantial amount of rubber for the war effort. Its rubber exports have risen markedly since the war, but the inaccessibility of much of the rubber has set a limit to the amount of the increase that can be expected. Up to the outbreak of the war the average annual exports were around 1,500,000 kilograms. In 1941 these rose to 1,778,663 kilo-

grams and to 3,035,076 kilograms in 1942, but dropped to 2,186,207 kilograms in 1943. However in 1944 2,801,035 kilograms were shipped out of the country.

About the experiment station for rubber established at Pichilingue it is reported that several hundred thousand rubber seedlings have already been planted and are practically ready for distribution to growers.

LATIN AMERICAN NOTES

Panama has reacted to the promptings of the United States for intensified rubber production in a gratifying manner. In 1940 the republic exported only 5,883 kilograms; by 1942 the amount had jumped to 30,444 kilograms, to increase more than tenfold in the next year, when about 310,000 kilograms left the country. In 1944 exports further rose to 348,720 kilograms. Rubber production in the year 1944 is reported to have been 312,402 kilograms.

Several tire retreading plants are operated in Panama, and one opened by a United States rubber firm early in 1944 recapped more than 12,000 tires in the last half of that year. The company in question recently installed additional machinery and therefore hopes to be able to handle considerably more work in the current year.

Nicaraugua was reported to have exported one million pounds of rubber to the United States during the first four months of 1945.

Nicaragua also has a cooperative experimental station which was recently started at El Recreo, in eastern Nicaragua. The local government has completed some buildings, and others are expected to be ready in the current year. It was expected that early in this year several hundred thousand high-yielding rubber plants would be ready for distribution to growers.

Rubber production in Brazil continues to show some increase, and in 1944 output totaled about 26,000 tons. Production for 1945 is expected to show a further rise. During the peak years from 1910 to 1912 an annual average of approximately 40,000 tons was produced.

Certain American rubber manufacturers are reportedly planning to extend their activities to Cuba in the postwar period. Among the new enterprises said to be under consideration is a plant for the manufacture of rubber-soled tennis shoes, a tire repair establishment, and a factory for general rubber goods.

Venezuela is reported to have produced 30 metric tons of *Hevea* and nine tons of *Castilloa* rubber in March, 1945, the highest output obtained in any recent month. At the same time the output of tires by the local tire factory for that month is said to have been 3,530 tires, nearly a record number.

AFRICA

South Africa's leading tire factory was established at Port Elizabeth in 1936, when it employed 177 persons. War conditions so stimulated local production of all kinds of tires, chiefly for the Armed Forces, that by October, 1944, 894 persons were on the company's payroll. Up to June, 1944, the factory had been operating on two nine-hour shifts and 5½ days a week, but this was changed to three eight-hour shifts six days a week. The Port Elizabeth firm is the biggest single producer of large tires for superfortresses in the Eastern Group Supply Council organization, and its tires go to forces in the India-Burma-China theatre of war as well as to the R.A.F. in Rhodesia and the South African Air Force. The tires with rayon cord which are now produced are said by executives of the company to be particularly suited to the road and climatic conditions of the country, and they expect that this type of tire will be used extensively in South Africa after the war, particularly in the motor transport services.

In South Africa a certain quantity of tennis balls is also made, but recently heavy, synthetic rubber balls covered with thick melton have been arriving from America in fairly large quantities.

The Union Defense Force first takes as many balls as it requires, and the rest are available to the public.

Besides various goods of rubber, South African manufacturers have also begun to produce articles made from plastics. The most successful of these new lines seem to be toys including automobiles, trucks, and tanks, which are claimed to be practically unbreakable, to be available at lower than prewar prices and designed to compete with postwar importations.

In Johannesburg plastic powders are being put out for molding battery cases, door and window fittings, and laminated pipes. Other plastic goods made here—in many cases from raw materials entirely of South African origin—include electric cleats and bath plugs, lipstick containers, six-inch plastic wall tiles in mottled effects, egg cups, salt shakers, condiment sets, wedge heels, and plastic flooring blocks. Locally made plastic stoppers and caps for containers of cosmetics and the like have not proved completely successful; there have been many complaints about undesirable odors transmitted from stoppers to the contents of the packages, and it has consequently been suggested to local manufacturers that they study the trades they supply and develop appropriate methods of producing material to suit specific needs.

Production costs for plantation rubber show a considerable rise in some countries of West Africa where labor formerly was very cheap. Thus the 1944 report of the Offin River (West Africa) Rubber Co. shows f.o.b. costs for the year amounting to 8.37 pence per pound.

Reports from two rubber companies operating in Uganda have just been issued. Uganda Plantations states that during the year ended February 29, 1944, rubber production came to 81,371 pounds against 78,064 pounds in the preceding fiscal year. Receipts from rubber sales amounted to £5,269. Kivuvu (Uganda) Rubber, whose business year closed on January 31, 1944, booked receipts of £5,556 from rubber sales. This company seems to have had some difficulty with labor, for it reports that despite increased rate of pay and payment based on results there was a great deal of absenteeism. Nevertheless the amount of rubber harvested increased from 79,869 pounds in 1942 to 84,282 pounds in the business year under review.

Soon after Vichy officials were displaced, about the middle of 1943, production in French Africa of various commodities including rubber was pushed ahead as far as possible. In 1943-44 output in French Guinea was increased to 2,000 tons, and on the Ivory Coast rubber production rose from 220 tons in 1942 to 1,350 tons in the 1943-44 period. Larger outputs were also reported from the Sudan, but no figures were given.

The French Government has thus accumulated several thousand tons of rubber, but unfortunately owing to transport difficulties, it has so far been possible to ship only a small proportion of the rubber to the French factories now being reopened.

Foreign sources state that it is planned to establish a plastics industry in Egypt. Apparently some progress has already been made as it is expected to begin full production about the end of 1946. Few details are available, but it has been indicated Egyptian cotton is to be used as raw material.

Editor's Book Table

BOOK REVIEWS

"Technical Data on Plastics." Plastics Materials Manufacturers' Association, 14th and K Sts., N.W., Washington 5, D. C. April, 1945. 164 pages. Price $1.50.

A revised issue of this bulletin compiled and published by the Plastics Materials Manufacturers' Association is now being distributed "to acquaint its user with the nature, particular merits and utility of various plastics and with property values, as measured by recognized methods, commonly to be expected in available forms and modifications of the various basic compositions."

The new edition is the first since August, 1943, and incorporates changes and additions to previous data, and property summarizations on cast allyl and polyethylene plastics. There is also a section on low-pressure laminating plastics, which includes, in addition to information on composition and fabrication, a description of paper base, fabric base, and asbestos base grades.

The bulletin covers 20 types of material and seeks to tabulate all possible known data for use of those in industry and government agencies concerned with the application of plastic materials in the war effort. It is sponsored by the 22 member companies comprising the PMMA.

Material for which data are given are: casein plastic, cast allyl plastics, cast phenolic resins, cellulose acetates, cellulose acetate butyrates, cellulose nitrate, ethyl cellulose, laminated phenolic products, melamine molding materials, methyl methacrylates, nylon, phenol-formaldehyde molding materials, phenol furfural molding materials, polyethylene plastics, polystrenes, polyvinyl formals, acetals, and butyrals, polyvinyl chloride plastics, urea-formaldehyde molding materials, vinylidene chloride and vinyl chloride-acetate resin compounds.

"Autumn Leaves—Reflections of an Industrial Lieutenant." P. W. Litchfield. Corday & Gross Co., Cleveland, O. Cloth, 5¼ by 9¼ inches. 126 pages. Illustrated.

This book, a philosophy lived by Paul W. Litchfield, chairman of the board of The Goodyear Tire & Rubber Co., Akron, O., has as its aim the desire "to help a man in giving the proper weight in his thinking to a plan of life and work that calls for study, preparation and action; for healthy competition and high service; for thrift and saving; for courage and aggressiveness."

The two parts of the book, one personal philosophy, and the other, business philosophy overlap one another as any consistent philosophy must. In the first part the author discusses the effect of environment and education on the individual and their importance in creating a more productive person.

Emphasizing the value of time, he states, "Every man's greatest capital asset is his unexpired years of productive life."

A chart showing the life span paralleling the seasons of the year is included.

In "Business Philosophy," Mr. Litchfield points out that in order to achieve the full utilization of all that man has created, it is essential that labor, capital, and consumer cooperate—he relates the uselessness of capital without labor and conversely. It is necessary to appreciate the 'other fellow's usefulness in one's plan of life in order to realize more fully your own.

He discourses upon youth and the part that it must play in any progressive business. For with age comes conservatism, which in turn brings about stagnation—and in this era of progressiveness, the author considers this a crime against society.

The illustrations by Rockwell Kent fully carry out Mr. Litchfield's glorification of man and his place in the universe.

"The Future of Industrial Research. Silver Anniversary Forum." Standard Oil Development Co., 30 Rockefeller Plaza, New York 20, N. Y. Cloth, 9¼ by 6¼ inches. 174 pages.

This book is a compilation of the papers and discussions presented at the Silver Anniversary Forum of Standard Oil Development Co. held last October. It is an attempt to present a cross-section of qualified opinion on the future of industrial research. The most important questions, "What should be the guiding principles and objectives for the commercial programs of industrial research and development organizations?," "How can small business serve itself and be served by industrial research and development?," and "What place should industrial research and development organizations allocate to future work directed primarily toward national security?," serve as the themes and basis for the three divisions of this book.

Pertinent thought on the first question is offered by giving the

viewpoints on the future of industrial research, of a physicist, Frank B. Jewett, a chemist, Thomas Midgley, Jr., industrial management, Harry L. Derby, and by Bradley Dewey on "Industrial Research by Small and Large Business." It is stressed that research organizations are becoming a major factor in determining the economic and political future of the United States. An answer to the problem of the returning serviceman must be worked out through private enterprise as the industries' capacity for employing them is limited.

The second theme is discussed by Edwin Land in "Research by Business Itself," Westbrook Steele, "Research by Trade Associations and Cooperative Groups," Earl P. Stevenson, "The Growth Factor in Small Business," Clyde E. Williams, "How the Research Foundation May Serve Small Business," and A. C. Fildner, "Research by Government and Its Value to Small Business." These papers expound upon the need of collective research within industries—benefitting both large and small companies. The importance and necessity of small companies to support a technical staff, and to keep alive the motivating factor of development—incentive—are emphasized. Cooperative research plans of the various governmental agencies are outlined.

The final discourse is by Robert P. Patterson on "National Defense and Industrial Research," which expands upon the idea of the necessity of cooperation between industry, university laboratories, government laboratories, and the Armed Services—and the importance of an overall directing council for research and development in the postwar world.

"Russ's Bus. The Adventures of an American Bus Driver." Russell A. Byrd. Wetzel Publishing Co., Inc., Los Angeles, Calif. Cloth, 8½ by 5¾ inches, 200 pages. Price $2.25.

Russ Byrd, one of the pioneer drivers of early transcontinental bus travel, relates his experiences on the unpaved roads of yesterday and some of his encounters with "the nicest folks in the world—migratory Americans," and brings his account up to the present-day difficulties of modern wartime travel. He succeeds in "bringing one to the spot," when surmounting almost impossible tasks in bringing his bus through difficulties and trying to get in on schedule. In relating some of his troubles and the assistance his company gave him he pays tribute to American business men's ingenuity and resourcefulness.

NEW PUBLICATIONS

"Micronoil Moldeze. A Treatment for Plastic, Rubber and Metal Molds." Protective Coatings, Inc., Box 56, Detroit 27, Mich. 4 pages. This folder describes the use of Moldeze in the various molds mentioned above. Moldeze is applied by brushing, mist spraying, or felt applicator, a method especially recommended. An advantage cited, inasmuch as plastics are concerned, is that Moldeze does not cloud, mar, or water mark the finish of translucent, transparent, and crystal plastics.

"Fuzon-O." The Stanley Chemical Co., East Berlin, Conn., 8 pages. The booklet offers a description of the properties of the special compounded vinyl resin and also lists various special applications to which this plastic is particularly suited: namely, water resistant fabrics, fabric shoe materials, for fabrics or glass cloth used in coating cable or wire sleeving, for cast or unsupported film production, for treating belting, impregnating fabrics, laminating, and upholstery. Other subjects covered in the booklet are types of vinylite resin coatings, and fusing. At present Fuzon-O is not available to civilians, being subject to the control of the Chemical Branch of the WPB and the Army and Navy.

"Specifications for Government Synthetic Rubbers." Rubber Reserve Co., Washington, D. C. 80 pages. Specifications, sampling procedure, chemical and physical methods of analysis, and an appendix containing a list of suppliers of RRC Standard Compounding Ingredients for the 16 different types and grades of government synthetic rubbers, effective July 1, 1945, are included in this bulletin. The purpose is obviously to collect in one place and bring up-to-date all the individual reports issued during the course of the last two or three years. A correction to Section A-4-a for GR-A modulus at 300% was issued on July 6.

Publications of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. **"Polyac, Accelerator for Neoprene from Latex Compositions."** Report BL-194. 10 pages. **"Freeze Resistance of Neoprene GR-M."** Report BL-196. 9 pages. Booklet BL-194 discusses the use of Polyac as an accelerator for use with typical latex compositions. Three bar graph tables are included: tensile strength, stress at 800%, and permanent set of neoprene films cured in air at 100°, 120°, and 140° C. Booklet BL-196 is more or less an addition to studies made by du Pont in April. It lists the four fundamentals of freeze resistance, or specific types of freeze resistance, and goes on to discuss crystallization, plasticizer time effect, brittle temperature control, and application to other types of neoprene.

"Dutrex 20-Dutrex 25 Plasticizers for Vinyl Chloride Resins." Shell Oil Co., Inc., 50 W. 50th St., New York 20, N. Y., 16 pages. The second report under this title, this brochure contains additional information not covered in the first report. There are four general topics discussed. Compatibility of Dutrex 20 and 25 with polyvinyl chloride, Dutrex 20-polyvinyl chloride compound properties, Dutrex 25-polyvinyl chloride compound properties, and methods of test. Tables of performance data are to be found throughout the report, some of them are based on the per cent of Dutrex 20 in the total plasticizer content, and most of the remainder concern themselves with per cent of Dutrex 25 under these same conditions. In the last section complete data are given as to how the samples were prepared and other pertinent information.

Hoggson & Pettis Catalog. Hoggson & Pettis Mfg. Co., New Haven, Conn. 30 pages. Among the equipment for the rubber industry listed are, cementing and vulcanizing tools and thickness gages used for both rubber and plastics. There are also illustrations of rubber and plastic molds, among them being: air vent elbow mold, airplane fuel cell gasket molds, and syringe bag molds. A.S.T.M. molds and dies for rubber testing are also included. Prices are not quoted for all products illustrated in the catalog.

"One Hundred Years of Recreation, 1845-1945." The Brunswick-Balke-Collender Co., Chicago 5, Ill. 48 pages. Several facts of interest to those concerned with rubber are included in this brochure which portrays the history of sports up to the present time. Rubber cushions were patented by Brunswick in 1857 for use on billiard tables. Brunswick experimented with rubber tire construction for seven years and offered its product on the selling market in 1916. There were 2,000 tires produced daily after 1916, and production continued until 1922 when this division was sold to The B. F. Goodrich Co. The Goodrich company designated Brunswick to supply self-sealing fuel cells during the present war.

"General Sales and Distribution Circular—Natural and Synthetic Rubber." July 1, 1945. Reconstruction Finance Corp., Office of Rubber Reserve, Washington, D. C. 28 pages. As explained in the introduction, this circular sets forth the procedure for the sale and distribution by Reconstruction Finance Corp., Office of Rubber Reserve, of natural and synthetic rubber and supersedes all previous circulars issued by the Rubber Reserve Co. It is pointed out that as used in this Circular, the term "Rubber Reserve" means Reconstruction Finance Corp., Office of Rubber Reserve, 811 Vermont Ave., N.W., Washington, D. C.

"Everywhere in Industry It's Hycar Synthetic Rubbers." Hycar Chemical Co., 335 S. Main St., Akron, O. 20 pages. Of interest to all in the rubber industry, this illustrated booklet describes production and fabrication of Hycar and crude polymer properties and includes several tables with regard to the use of Hycar to the best advantage. One of the tables, "Suggested Uses Everywhere in Industry," lists the various applications of Hycar with special emphasis on the automotive, aviation, petroleum, machinery, chemical, textile, printing, marine and railway industries. The other tables are: "Properties of Hycar Vulcanizates," "Physical Properties of Typical Vulcanizates," "Effect of Oil and Heat Aging," "Effect of Prolonged Fluid Aging," and "A General Guide in Applying Hycar OR-15 and OR-25." Many illustrations are included.

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Market Reviews

COTTON & FABRICS

New York Cotton Exchange Week-End Closing Prices

Futures	May 26	June 30	July 7	July 14	July 21	July 28
Aug. ..	....	22.69	22.69	22.92	22.76	22.70
Oct. ..	22.64	22.76	22.79	23.06	22.86	22.80
Dec. ..	22.58	22.77	22.81	23.08	22.87	22.79
Jan. ..	22.55	22.74	22.78	23.05	22.84	22.76
Mar. ..	22.57	22.72	22.83	23.06	22.91	22.80
May ..	22.45	22.68	22.82	23.05	22.87	22.75
July ..	23.04	22.46	22.58	22.84	22.69	22.52

SPOT middling prices fluctuated in July. The price of 23.11¢ on July 2 dropped to 22.24¢ on July 7, rose to the high of 23.51¢ on July 16, and closed at 23.30¢ on July 31.

At the beginning of the month, cotton futures were featureless and held within a narrow range; the market drifted under small price fixing and limited hedge selling, said to be mostly against government loan cotton. Toward mid-July, futures rose to new seasonal highs because of expectation of a greatly reduced crop. Later in the month, however, futures experienced a sharp decline under persistent liquidation, hedge selling, and peace rumors.

The New York Cotton Exchange service bureau estimated the total consumption of all cottons during June at 780,000 bales, a decrease of 51,000 bales compared with May and of 25,000 bales a year ago. However the daily rate was 1,000 bales higher this year: 36,100 in the year 1944 and 37,100 in 1945.

The Bureau of the Census, Department of Commerce, announced that a record production of second-cut cotton linters in the current year ending July 31 is indicated by preliminary figures for the ten months ended May 30, 1945. There was shown an output of 883,344 running bales. Total production of cotton linters in the first ten months of 1944-45 was 1,171,355 running bales which averaged 620.8 pounds gross weight. The 1943-44 production totaled 1,185,692 running bales with an average gross weight of 617.6 pounds per bale. This included 83,809 mill run running bales, 289,753 first cut running bales, and 812,130 second cut-running bales.

Fabrics

At the beginning of the month there was a moderate volume of business for nearby delivery against high ratings in gray cloths. Most of the actual trading was in print cloths. Sheetings were quiet, and osnaburgs remained dormant. Toward the mid-month period occurred a flurry of business in print cloths and sheetings; these set for delivery this month. Staple constructions also moved. Through this period trading had a tendency to slow down because of a pricing delay; merchants and mills were reluctant to place forward business until M-317A changes were announced. Trading in carded goods was negligible, being confined to isolated lots of print cloths released for quick delivery against high ratings. Sheetings were quiet, and there were no signs of activity with regard to osnaburgs.

When the drastically revised M-317A distribution order was issued later in the month, it brought activity in the gray cloth market almost to a standstill. Toward the end of the month, the gray cloth market was supplied with the M-317A text for the current quarter. Business continued at a standstill as mills and selling houses arranged production and selling schedules to new M-317A provisions.

The WPB announced that the present system of priority ratings would still continue to apply to textiles.

WPB has asked a representative number of mills to submit weekly telegraphic reports on their production of cotton, woolen, worsted or synthetic yarns and woven fabrics, in order to measure the results of the current textile production drive which, agency officials hope, would increase mill output by 30%. The weekly report will cover the pounds of sale yarn and yards of woven fabric produced and the quantity in each of the cotton, woolen, worsted and synthetic categories. Manufacturers will also continue to make reports on tire cord, duck, and on other special programs, even though part of such data will be incorporated in the over-all fabric report.

Supplement 1 to M-317A, issued July 12, covers priorities assistance for cotton fabrics for coating.

New York Quotations June 20, 1945

Drills		
38-inch 2.00-yard	yd.	$0.195
50-inch 1.52-yard		.29
52-inch 1.85-yard		.23875
52-inch 2.20-yard		.20511
59-inch 1.85-yard		.25202
Ducks		
38-inch 2.00-yard S.F.	yd.	.22875
40-inch 1.45-yard S.F.		.3086
51½-inch 1.35-yard D.F.		.33875
72-inch 1.05-yard D.F.		.45476
Mechanicals		
Hose and belting	lb.	.4225
Tennis		
51½-inch 1.35-yard S.F.	yd.	.33148
51½-inch 1.60-yard D.F.		.29218
Hollands — Rubber		
20-inch	yd.	.1225/.145
30-inch		.22 /.2575
40-inch		.245 /.29
Osnaburgs		
36-inch 2.94 Cl.	yd.	.1271
40-inch 2.11 P.W.		.1623
40-inch 2.65 Cl.		.1408
40-inch 3.65 Cl.		.10946
Raincoat Fabrics		
Cotton		
Bombazine 64 x 60, 5.35	yd.	.1375
Bombazine 64 x 56, 5.50		.1350
Print cloth, 38½-inch, 64 x 60		.09252
Sheeting, 40-Inch		
48 x 48, 2.50-yard	yd.	.172
64 x 68, 3.15-yard		.14761
56 x 60, 3.60-yard		.12638
44 x 40, 4.25-yard		.10352
Sheetings, 36-Inch		
48 x 44, 5.00-yard	yd.	.091
40 x 40, 6.15-yard		.07398
Tire Fabrics — Karded Peeler		
Builder		
17¼ ounce 60" 23/11 ply	lb.	.48
Chafer		
14 ounce 60" 20/8 ply	lb.	.48
9¼ ounce 60" 10/2 ply	lb.	.45
Cord Fabrics		
23/5/3, 1 1/8" cotton	lb.	.44
15/3/3, 1 1/8" cotton	lb.	.42
12/4/2, 1 1/8" cotton	lb.	.42
23/5/3, 1¼" cotton	lb.	.44
Leno Breaker		
8¼ ounce and 10¼ ounce 60"	lb.	.45

Compounding Ingredients Price Changes

Marmix	gal.	$1.35 /$1.75
Neoprene Latex Type (dry weight)		
60	lb.	.28 / .32
571	lb.	.25 / .29
Concentrated	lb.	.28 / .32
572	lb.	.28 / .32
Ridacto	lb.	.20
Ridbo 369	lb.	.08 / .09
369-F	lb.	.12

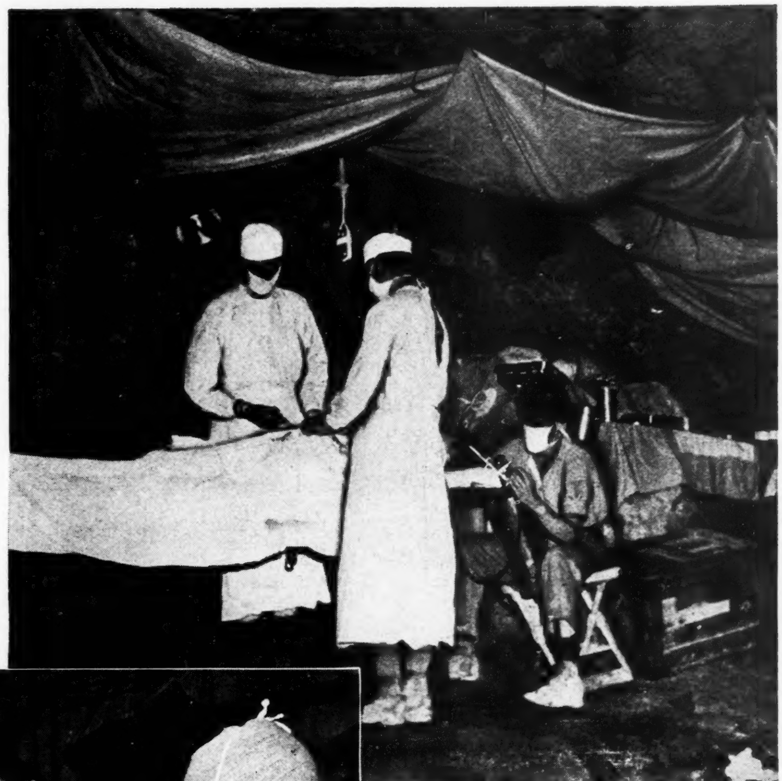
Rims Approved and Branded by The Tire & Rim Association, Inc.

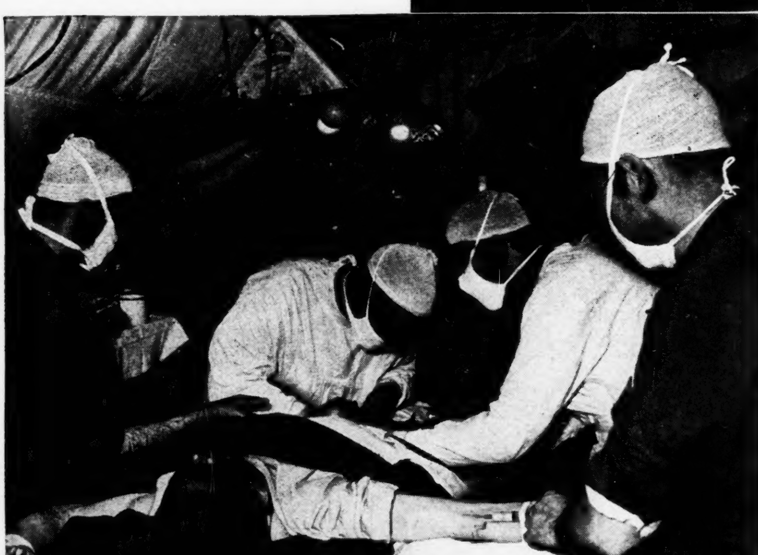
Rim Size	June 1945
15" & 16" D. C. Passenger	
16x4.00E	178,163
16x4.25E	49,832
16x4.50E	75,147
15x5.00E	1,503
16x5.00E	10,086
16x5.00F	4,393
15x5.50F	10,459
16x6.00F	4,256
16x4.00E-Hump	4,318
Flat Base Truck	
20x3.75P	1,141
20x4.33R	33,095
15x5.00S	9,883
20x5.00S	380,877
20x6.00T	48,703
22x6.00T	41
24x6.00T	170
15x7.33V	146
18x7.33V	75
20x7.33V	65,209
22x7.33V	4,491
24x7.33V	2,698
Semi D. C. Truck	
16x4.50E	3,728
15x5.50F	2,420
16x5.50F	1,691
Tractor & Implement	
16x3.00D	5,324
19x3.00D	17,012
20x4.50E	3,315
18x5.50F	882
24x6.00S	1,583
36x6.00S	169
24x8.00T	3,885
28x8.00T	3,082
32x8.00T	1,006
36x8.00T	1,415
W7-24	3,451
W8-24	12,243
W8-32	5,213
W8-36	2,026
W8-38	487
W10-28	817
W10-38	8,961
W10-40	302
DW8-38	1,379
DW9-38	9,054
DW10-38	9,983
DW11-38	2,542
DW12-26	839
DW12-30	3,711
DW12-34	3,337
Cast	
24x15.00	32
Total	994,575

SCRAP RUBBER

NATURAL rubber scrap is scarce and remains in very great demand. All tire parts continue generally available, with red and black passenger tubes also on the increase. There have been no price changes either in mixed auto tires or in beadless tires. The industry is awaiting word on the findings and decisions of a meeting held recently in Washington between dealers in scrap, reclaimers, and the OPA, and the issuance of a revision on R-1 is expected soon. There may be a new classification on split parts covered by the order.

No figures are available, at this writing, of consumption for May and June, 1945; however the consensus of opinion is that they will compare favorably with the 29,088-





ton figure of May, 1944, and the 28,042 figure for June of the same year.

Scrap Rubber Ceilings

Inner Tubes†	¢ per Lb.
Red passenger tubes	7½
Black passenger tubes	6¾
Truck tubes	6½
Tires‡	**$ per Short Ton**
Mixed passenger tires	20.00
Beadless passenger tires	26.00
Mixed truck tires	20.00
Solid tires	36.00
Peelings†	
No. 1 peelings	52.25
2 peelings	33.00
No. 1 light colored (zinc) carcass	57.75
Miscellaneous Items*	
Air brake hose	25.00
Miscellaneous hose	17.00
Rubber boots and shoes	33.00
Black mechanical scrap above 115 sp. gr.	20.00
General household and industrial scrap	15.00

† All consuming centers except Los Angeles.
‡ Akron only.
* All consuming centers.

RECLAIMED RUBBER

GENERALLY speaking, the demand for reclaim has been good, with production remaining about the same. The labor supply still is a problem to reclaimers. With formulations of programs for auto production on a small scale in the making, it is expected that use of reclaim will be stimulated. Reclaims have always found particular usefulness in auto parts. At this writing, no news is available on the findings of the Brooks Committee meetings in Washington and Akron.

Reclaimed Rubber Prices

Auto Tire	Sp. Grav.	¢ per Lb.
Black Select	1.16-1.18	7 / 7¼
Acid	1.18-1.22	8 / 8¼
Shoe		
Standard	1.56-1.60	7½/ 7¾
Tubes		
Black	1.19-1.28	11¾/12
Gray	1.15-1.26	12½/13½
Red	1.15-1.32	12½/13
Miscellaneous		
Mechanical blends	1.25-1.50	5 / 6

The above list includes those items or classes only that determine the price bases of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Financial

(*Continued from page* 615)

O'Sullivan Rubber Co., Inc., Winchester, Va. For 1944: net income, $354,-097, against $276,669 in 1943; net sales, $6,927,710, against $5,285,340.

Phillips Petroleum Co., Bartlesville, Okla., and subsidiaries. First quarter: net profit, $9,145,298, equal to $1.86 a share, against $3,713,011, or 76¢ a share, in the 1943 period.

Shell Union Oil Corp., New York, N. Y., and subsidiaries. For 1944: net income, $28,163,961, equal to $2.09 a common share, against $24,542,556, or $1.82 a share, in 1943. First quarter, 1945: net income, $8,461,601, equal to 63¢ a common share, against $6,808,358, or 51¢ a share, in the 1944 quarter.

Skelly Oil Co., Kansas City, Mo. For 1944: consolidated net income $7,222,903, equal to $7.36 a common share, against $5,461,708, or $5.56 a share in 1943; taxes, $5,300,000, against $5,342,000. First quarter, 1945: net income, $1,767,810, equal to $1.80 a common share, against $1,754,359, or $1.78 a share, in the corresponding period last year.

Socony-Vacuum Oil Co., Inc., New York, N. Y. For 1944: consolidated net income, $62,349,556, equal to $2 each on 31,708,452 capital shares outstanding, compared with $35,900,000, or $1.15 a share in 1943.

United Carbon Co., Charleston, W. Va., and subsidiaries. First quarter, 1945: net income, $496,958, equal to $1.25 a share, compared with $534,730, or $1.34 a share, in the like period last year; taxes, $418,-000, against $394,500.

Servus Rubber Co., Rock Island, Ill. Year ended February 28: net income, $159,-506, or $1.66 a common share, against $127,730, or $1.33 a share, for the preceding fiscal year.

Thermoid Co., Trenton, N. J., and subsidiaries. March quarter: net profit, $287,742, equal to 44¢ a common share, contrasted with $136,419, or 19¢ a share, in the first quarter of 1944; taxes, $192,200, against $96,150. Earnings of Joseph Stokes Rubber Co. and Joseph Stokes Rubber Co., Ltd., are not included in the 1944 figures.

Thiokol Corp., Trenton, N. J. For 1944: net income, $11,996, against $24,641 in 1943.

Fixed Government Prices*

	Price per Pound: Civilian Use	Price per Pound: Other Than Civilian Use
Guayule		
Guayule (*carload lots*)	$0.17½	$0.31
Latex		
Normal (*tank car lots*)	.26	.43½
Creamed (*tank car lots*)	.26¾	.44¾
Centrifuged (*tank car lots*)	.27¾	.45¾
Heat-Concentrated (*carload drums*)	.29½	.47
Plantation Grades		
No. 1X Ribbed Smoked Sheets	.22½	.40
1X Thin Pale Latex Crepe	.22⅛	.40
2 Thick Pale Latex Crepe	.22	.39½
1X Brown Crepe	.21⅜	.38⅞
2X Brown Crepe	.21⅛	.38⅝
2 Remilled Blankets (Amber)	.21¼	.38¾
3 Remilled Blankets (Amber)	.21⅛	.38⅝
Rolled Brown	.18	.35½
Synthetic Rubber		
GR-M (Neoprene GN)	.27½	.45
GR-S (Buna S)	.18½	.36
GR-I (Butyl)	.15½	.33
Wild Rubber		
Upriver Coarse (crude)	.12⅝	.26⅛
(washed and dried)	.20¼	.37¾
Islands Fine (crude)	.14⅝	.28¼
(washed and dried)	.22½	.40
Caucho Ball (crude)	.11⅝	.24¾
(washed and dried)	.19½	.37
Mangabiera (crude)	.08½	.19¾
(washed and dried)	.18	.35½

* For a complete list of all grades of all rubbers see Rubber Reserve Co. Circular 17, p. 169, May, 1943, issue.

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)
Allow nine words for keyed address.	**Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.**	*Replies forwarded without charge*

SITUATIONS OPEN

WANTED: PLANT ENGINEER

TO TAKE FULL CHARGE OF INSTALLATION OF NEW MACHINERY, MAINTENANCE, PLANT LAYOUT, ETC., IN A SMALL RUBBER PLANT LOCATED IN WESTERN OHIO. THIS IS AN ESTABLISHED SUCCESSFUL COMPANY OF LONG STANDING AND WITH EXCELLENT POSTWAR POSSIBILITIES. A GRADUATE ENGINEER WITH SOME RUBBER EXPERIENCE IS DESIRABLE BUT NOT ESSENTIAL. STATE QUALIFICATIONS AND SALARY DESIRED IN FIRST REPLY. CONFIDENTIAL TREATMENT ASSURED.

ADDRESS BOX NO. 216, CARE OF
INDIA RUBBER WORLD

WANTED: BRAIDED HOSE SPECIALIST

for consultation on production of two- and three-braid synthetic rubber hose. Must be a person conversant with very latest methods of manufacture, equipment, and costs. Remuneration based on consultation fee basis. State experience and qualifications.

ADDRESS BOX NO. 237, CARE OF INDIA RUBBER WORLD.

TIRE AND TUBE PLANT LOCATED IN SOUTH HAS OPENING for rubber chemist. Requirements: Experience in all phases of processing and manufacture of tire and tube stocks. Good opportunity for energetic man looking for a postwar job with possibilities of advancement. Give full particulars including expected salary in first letter. Address Box No. 203, care of INDIA RUBBER WORLD.

TIRE AND TUBE DEVELOPMENT AND SPECIFICATION ENGINEERS—Progressive small eastern concern. Definite opportunity for advancement for man with experience and capability. Address Box No. 204, care of INDIA RUBBER WORLD.

CHEMIST OR CHEMICAL ENGINEER WANTED for quality control, development and research work. Experience with resins and compounding natural and synthetic rubber desirable. Permanent position with old-established company. Plant located in Maine. In reply give age, education, experience, and salary expected. Address Box No. 209, care of INDIA RUBBER WORLD.

WANTED: YOUNG GRADUATE CHEMICAL ENGINEER TO ACT as an assistant to chief chemist of small old-established eastern rubber company, New York area. Should have some compounding experience on rubber and synthetics and also experience in mill and tubing machine control. Write giving full details of training and experience and salary expected. Address Box No. 210, care of INDIA RUBBER WORLD.

WANTED: MAN FAMILIAR WITH GENERAL LABORATORY testing and compounding. Plant located in Yale, Michigan. Write giving full details of training, experience, and salary expected. Address Box No. 211, care of INDIA RUBBER WORLD.

ENGINEER FOR MIDWEST COMPANY PRODUCING MECHANICAL rubber goods. Must have wide experience, thorough knowledge of mold design. Top grade man required. Excellent future. List qualifications, salary desired, and send photograph. Address Box No. 217, care of INDIA RUBBER WORLD.

BELT MAN. The position of Assistant Manager of Belting Division in the Sales Dept. of large rubber manufacturer is open. If you are qualified for such a position, write us in detail to secure an interview at a convenient location. An unusual opportunity for permanent position for person who is looking for the future. Address Box No. 218, care of INDIA RUBBER WORLD.

SITUATIONS OPEN (Continued)

PRODUCTION MANAGER

For exceptionally high-grade synthetic mechanical goods plant, employing 350. Must be capable of taking full charge of production. Ably supported by large, well-staffed laboratory and aggressive sales department. Firm enjoys top reputation for quality and engineering developments. ATTRACTIVE SALARY.

Address Box No. 219
Care of INDIA RUBBER WORLD

SPREADING ROOM FOREMAN

with experience in general proofing.

Suburban Boston Area. Permanent postwar position. Must be able to furnish Certificate of Availability.

ADDRESS BOX NO. 910, Care of INDIA RUBBER WORLD.

CHEMIST—Thorough knowlege of tire, tube, or mechanical goods manufacture. Plant located in Pennsylvania. Excellent opportunity. All replies strictly confidential. Address Box No. 205, care of INDIA RUBBER WORLD.

WANTED: ASSISTANT CHEMIST, MALE OR FEMALE, FOR rubber research and development. Steady position. Write full particulars to DANBURY RUBBER COMPANY, DANBURY, CONN.

WANTED: PRODUCTION MANAGER EXPERIENCED IN MASS production of low-priced rubber molded products. Exceptional opportunity for qualified man. Send complete details. Address Box No. 222, care of INDIA RUBBER WORLD.

TECHNICAL SUPERINTENDENT FOR RECLAIM RUBBER plant, located in East. Excellent postwar future. Send résumé to Box No. 223, care of INDIA RUBBER WORLD.

CHEMIST OR CHEMICAL ENGINEER WANTED FOR POSITION of Superintendent of Rubber Dispersion Plant. Eastern location. Excellent postwar future. Send résumé to Box No. 224, care of INDIA RUBBER WORLD.

SHIFT FOREMEN FOR RUBBER DISPERSION AND RECLAIM rubber operations. Plant located in East. Excellent postwar future. Send résumé to Box No. 225, care of INDIA RUBBER WORLD.

TIRE CURING FOREMAN—Opening for experienced foreman capable of supervising production. Attractive postwar as well as present-day opportunity. Eastern concern. Address Box No. 206, care of INDIA RUBBER WORLD.

CHIEF CHEMIST OR CHEMICAL ENGINEER: EXPERIENCED IN compounding natural rubber and synthetic rubber (neoprene and GR-S). Production quality control, development and research work. Excellent postwar opportunities. Plant located in Rhode Island. Address Box No. 226, care of INDIA RUBBER WORLD.

FOREMAN, RUBBER MILL AND CALENDER DEPARTMENT. California concern. Excellent opportunity for man desiring to make home in California. Write giving complete experience first letter. Address Box No. 227, care of INDIA RUBBER WORLD.

WANTED: DEVELOPMENT ENGINEER WITH KNOWLEDGE or experience in rubber and plastic compounding, processing, and production Position offers opportunities in research and development, production, and technical sales. Location—Middle West. Prefer young man with ability and ambition to advance. Give full information as to training, experience, and salary desired. Address Box No. 228, care of INDIA RUBBER WORLD.

(Classified Advertisements Continued on Page 648)

CLASSIFIED ADVERTISEMENTS

Continued

SITUATIONS OPEN (Continued)

TIRE FINISHING SUPERVISOR—Must have experience in supervising all duties connected with cured tire final finishing. Excellent opportunity for advancement with post-war security. Located in Pennsylvania. Address Box No. 207, care of INDIA RUBBER WORLD.

CHIEF RESEARCH CHEMIST WANTED FOR AN OLD-ESTABlished and progressive hard rubber company in New Jersey. Experience in compounding, molding, and detailed knowledge of rubber technology is necessary. Work is mostly directed toward development of new processes and improving old ones. Must be able efficiently to supervise a laboratory force of 12 assistants. Give educational and business background, age, and salary expected in first reply. Address Box No. 229, care of INDIA RUBBER WORLD.

PHYSICAL CHEMIST—RESEARCH AND DEVELOPMENT. Specialist in resin, emulsions, and colloids. Should have experience in natural and synthetic latex. Plant located in Middle West. State qualifications. Address Box No. 230, care of INDIA RUBBER WORLD.

TUBE ROOM SUPERINTENDENT AND FOREMAN—Must have thorough knowledge of all phases of inner tube manufacture. Opening offers excellent opportunity to man with initiative and ability. Plant located in Pennsylvania. State qualifications in first letter. Address Box No. 208, care of INDIA RUBBER WORLD.

WANTED: RUBBER CHEMIST—SUCCESSFUL AND LONG established eastern manufacturer offers an excellent opportunity for a rubber chemist possessing above-average experience with emulsions and compounded synthetic rubber in organic solvents. Our final selection will probably be aged between 30 and 40 years with natural ability to guide our research development and production control of natural and synthetic rubber latices based upon neoprene or GR-S polymers, pigments, accelerators, acceptors, etc., for use in pressure-sensitive adhesives, laminates, impregnates, and combining compounds as required by the paper, fabric, and leather industries. Solvent-type adhesives derived from neoprene, buna polymers, etc., for bonding vinyl plastics, leather, fabric, etc., are similarly included in our research and production program. Applicants should be thoroughly familiar with modern laboratory milling, compounding, and dissolving equipment. This opening is supplementary to our existing technical staff and is made necessary by our long-planned expansion program. Rubber chemists who sincerely believe their future "ceiling of opportunity" is inadequate for their talents are especially urged to file application for this opening. Formal application obtainable by addressing card or letter to Box No. 233, care of INDIA RUBBER WORLD. All replies completely confidential; our present staff is informed of this announcement.

WANTED: WIRE AND CABLE ENGINEER FOR DEVELOPMENT by progressive corporation in Connecticut. Excellent opportunity for either Electrical or Chemical Engineer. Experience preferred, but not essential. Address Box No. 234, care of INDIA RUBBER WORLD.

ORGANIC RESEARCH CHEMIST: DEVELOPMENT OF RECLAIMing processes for natural and synthetic rubbers. Location Western N. Y. Rubber experience desirable. Address Box No. 239, care of INDIA RUBBER WORLD.

SITUATIONS WANTED

TIRE DESIGN, DEVELOPMENT, AND SPECIFICATIONS FOR passenger and truck tires, including allied products. Able to take full charge of these services in your plant after Oct. 1st. Background of over fifteen years' experience. Address Box No. 212, care of INDIA RUBBER WORLD.

WORKS MANAGER—YOUNG FAMILY MAN, AT PRESENT IN charge of all operations in Los Angeles area rubber plant doing better than one half million yearly, seeks change as present set-up curtails future. Extremely capable, with full knowledge of production and labor problems as well as office and sales procedure. Position must be in Los Angeles Area only. Minimum salary $7,500. Address Box No. 213, care of INDIA RUBBER WORLD.

RUBBER AND THERMOPLASTIC MATERIALS CHEMIST—MARried; 7 years' experience in compounding rubber, synthetic rubber, and thermoplastic materials for wire and cable. Prefer position of Chief Chemist with a small progressive firm. Address Box No. 214, care of INDIA RUBBER WORLD.

GENERAL MANAGER—ENERGETIC, YOUNG, CAPABLE EXECUTIVE—draft exempt—quickly adaptable to any line or rubber product—in present position 2½ years—have control of production, buying, labor, office and sales of camelback and processing plant doing over $50,000.00 per month. Prefer position in Los Angeles area; available on thirty-day notice. Minimum salary $6,000. Address Box No. 220, care of INDIA RUBBER WORLD.

YOUNG EXPERIENCED SALES ENGINEER'S OFFICE REPRESENTING well-known rubber company can develop profitable diversified volume in southeastern Michigan for non-competitive concern specializing in hose. Over 125 customers. B. M. BOND, 3304 Eaton Tower, Detroit 26, Mich.

CHEMICAL ENGINEER, CAPABLE COMPOUNDER, REsearch and production control. Twenty-five years' experience in natural and synthetic rubber and reclaims. Capable producer from raw materials to finished product. Mechanicals, also wide variety of rubber goods. Cost experience and quality expert. Address Box No. 231, care of INDIA RUBBER WORLD.

CONSULTANT ENGINEER—REGISTERED—PLANning, Production, Materials Handling, and Procurement. 25 years serving industry. Address Box No. 238, care of INDIA RUBBER WORLD.

(Classified Advertisements Continued on Page 650)

Classified Advertisements

Continued

MACHINERY AND SUPPLIES FOR SALE

FOR SALE: NEVER USED Cleveland Speed Reducer, 139 H.P. ratio 8 to 1. Tubers 3¼" to 6". 3—30 x 24" Hydraulic Presses, 12" rams. 4—W. & P. Mixers up to 625-gallon capacity; 10—High Pressure Hydraulic Pumps, Accumulators up to 6,000 GPM. Dry Mixers, Grinders, Pulverizers, etc. Send for complete list. CONSOLIDATED PRODUCTS CO., INC., 13-16 Park Row, New York 7, N. Y.

(Classified Advertisements Continued on Page 652)

Eagle-Picher

PIGMENTS FOR THE RUBBER INDUSTRY

Red Lead (95%·97%·98%)	**Sublimed Blue Lead**
Sublimed Litharge	**Sublimed White Lead**
Litharge	**Basic White Lead Silicate**

Basic Carbonate of White Lead

• The above products are among the comprehensive line of zinc and lead pigments manufactured by The Eagle-Picher Lead Company for the rubber, paint and other process industries. Eagle-Picher research facilities are available to manufacturers on request. Write for free samples and literature.

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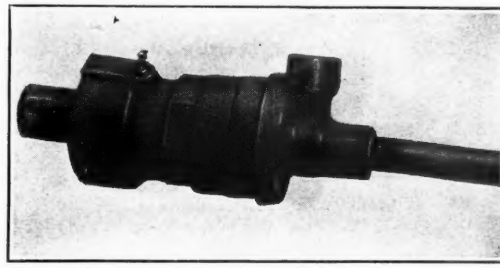

DIAMOND REVOLVING JOINTS

—for rubber mills, mixers, and for every kind of steam-heated and water-cooled roll in rubber plants and other industries. Patented construction prevents leaking. Molded gasket last 14 months on average in severe service—easy, quick, cheap to replace. No tight packing to act as brake on roll. Use just one joint to a roll, leaving one end clear for pipes.

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DIAMOND METAL PRODUCTS CO.
406 MARKET ST. ST. LOUIS 2, MO.

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WE SPECIALIZE IN MOLDS FOR
Heels, Soles, Slabs, Mats, Tiling and Mechanical Goods

MANUFACTURED FROM SELECTED HIGH GRADE STEEL BY TRAINED CRAFTSMEN, INSURING ACCURACY AND FINISH TO YOUR SPECIFICATIONS. PROMPT SERVICE.

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GR-S LATEX

CONCENTRATED GR-S LATEX (58%)

COMPOUNDS FROM SYNTHETIC LATICES

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REVERTEX (73-75%)
60% LATEX
NORMAL LATEX

We maintain a fully equipped laboratory and free consulting service.

FINELY PULVERIZED—BRILLIANT

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Cleveland, PALMER-SCHUSTER CO., 975-981 Front St.

Manufactured by
BROOKLYN COLOR WORKS, Inc.
Morgan and Norman Aves. Brooklyn 22, N. Y.

CLASSIFIED ADVERTISEMENTS

Continued

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RECORD MANUFACTURING CONSULTANTS
EQUIPMENT, MATERIALS & SUPPLIES
POINSETTIA, INC., 102 CEDAR AVE., PITMAN, N. J.

WANT TO BUY INTEREST IN CAMELBACK plant, or will purchase same at a reasonable figure. Address Box No. 201, care of INDIA RUBBER WORLD.

RUBBER GOODS MFG. PLANT FOR SALE: GOING PROFITABLE concern with good equipment. Total price $30,000. Address Box No. 202, care of INDIA RUBBER WORLD.

RUBBER MOLDING PLANT WANTED: WILL PURCHASE OUTright or substantial interest in well-equipped plant. Location—New Jersey, Eastern Pennsylvania, Connecticut, or Eastern New York. Send full particulars. Address Box No. 221, care of INDIA RUBBER WORLD.

FACTORY SPACE AVAILABLE

30,000 sq. ft. or more
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SUITABLE FOR IMMEDIATE USE — HELP AVAILABLE
WILLING TO EQUIP MACHINERY FOR WELL-SELLING RUBBER ARTICLES

Location: Danielson, Conn.

ADDRESS BOX NO. 215, CARE OF INDIA RUBBER WORLD

YOUR OPPORTUNITY

Investigate the possibility of tax benefits under existing conditions to sell your going manufacturing business for cash. Complete assets, capital stock of manufacturing firms, machinery manufacturers or industrial plants wanted. Your every confidence is held with all personnel retained if possible. Substantial capital available. Prefer businesses of over $100,000. Address Box No. 160, care of INDIA RUBBER WORLD.

MACHINER AND SUPPLIES WANTED

BANBURY MIXER IN FIRST-CLASS CONDITION. FORWARD fullest possible detail, including best price to the MARTIN RUBBER CO., INC., LONG BRANCH, NEW JERSEY.

WISH TO PURCHASE HYDRAULIC PRESSES, INJECTION Molding Machines, Mixers, Mills, Pumps, Vulcanizers, Calenders, Banbury Mixers. No dealers. Address Box No. 235, care of INDIA RUBBER WORLD.

WANTED: COMPLETE RUBBER PLANT EQUIPMENT, INCLUDing Mills, Presses, Pumps, W.&P. or Banbury Mixers, Screens, etc. Send complete description, location, and prices. Address Box No. 236, care of INDIA RUBBER WORLD.

WANTED

Autoclave 50-75 ga. capacity, with agitator and bottom drain. Steam-jacketed, 100 lb. steam pressure; internal pressure 200 lbs. per sq. in.

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LONG ESTABLISHED REPUTABLE CONCERN WITH SUBSTANTIAL CAPITAL

WILL BUY FOR CASH

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Box 1220, 1474 B'way, New York (18), N. Y.

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STOCK SHELLS HOSE POLES
MANDRELS

NATIONAL SHERARDIZING & MACHINE CO.
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Representatives
Akron San Francisco New York

ENERPRENE

A Non-Rubber Cement for Bonding Synthetic Rubber to Metal, etc.

THE ENERPRENE COMPANY
1910 First Central Tower Akron, Ohio

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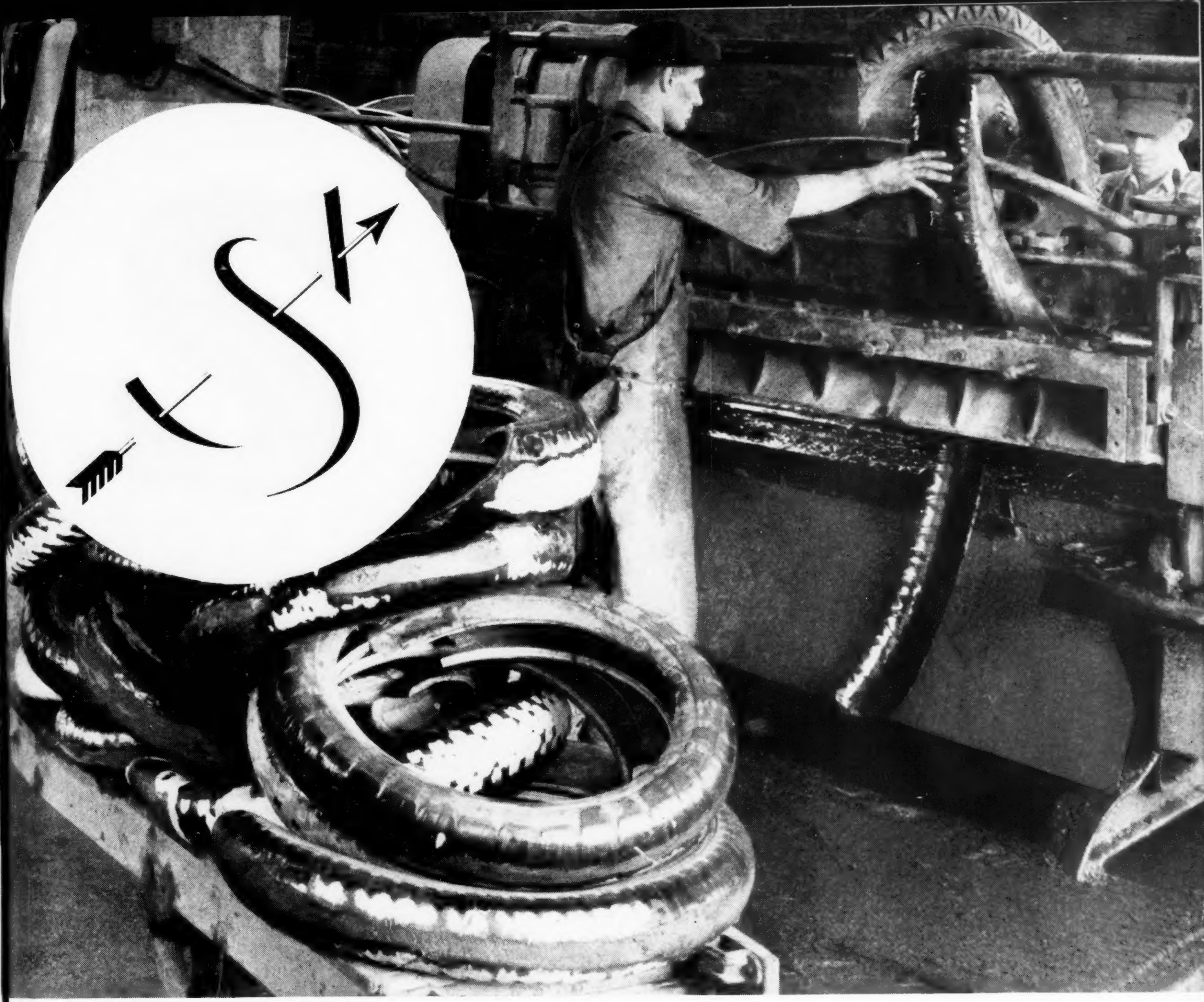

The Schulman Science of Scrap Rubber . . . .

Sorting and segregating natural rubber from synthetic scrap has become an added function of the Scrap Rubber industry. Skilled workmen at a Schulman plant are shown here, separating natural rubber carcasses from synthetic treads with careful precision. It's part of Schulman's modern method of handling Scrap Rubber to produce exactly what you need, exactly as you specify it. Be *safe* with Schulman.

A. Schulman Inc.

Scrap Rubber

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